Roanoke River National Wildlife Refuge
Annual Narrative

Windsor, North Carolina
Calendar Year 2009

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FORWARD

The Roanoke River National Wildlife Refuge (Refuge) staff along with numerous other stakeholders came to settlement in the cooperative FERC relicensing with Dominion Generation (DG) after ten years of meetings. DG was issued a new license on March 31, 2004. The license was amended in March 2005 to replace articles requiring DG to cooperate with the various agencies that make up the Cooperative Management Team (CMT) and conduct studies and monitor the impacts of the managed flows on resources downstream of the dam. The CMT was made up of representatives from North Carolina Wildlife Resources Commission, the North Carolina Department of Environment and Natural Resources, the U.S. Fish and Wildlife Service (FWS), the National Marine Fisheries Service, and the Regional Partnership of Local Governments in an ex-officio capacity. The staff's input has been through participation in the Fisheries and Terrestrial Committees.

River flow would determine, to a very large degree, the success of the FWS's potential refuge habitat management strategies. The Refuge staff has always, since early in the relicensing process in 1994, recognized that DG (formerly North Carolina Power) was a lesser player in river flow management decisions. The belief was, and continues to be, that the United States Army Corps of Engineers (USACOE) was the major player through flood control operations. However, when one considers the extent that the USACOE is also involved in hydro-power production, it gives one cause-to-pause regarding the driving force behind the USACOE's flood waters release policies. For instance, when winter flood releases are such that prolonged, moderate flows cause water to remain on the floodplain far into the growing season of spring, one could question the objective. Is it flood control or hydro-power production to fulfill contracts with Southeastern Power Administration? If releases are to prevent flood damage, why are they such that the resources in the lower ecosystem, including the Refuge, are damaged? If the USACOE Project, Kerr Dam, was built for flood control or to prevent flood damage, why not maintain 35,000 cfs releases in a manner that will disperse flood flows downstream during the dormant season as quickly as possible, mimicking more natural conditions? The 35,000 cfs flows flood the Refuge 14-16" deeper than 20,000 cfs flows, but the latter prolongs, sometimes by several weeks, flood releases. A lot of interested citizens on the floodplain below the project continue to ask questions. The fact that a lot of people, including Refuge staff, are asking questions is the reason Congress funded the current USACOE's Section 216 Study. The Section 216 study, designed to allow the USACOE to review their flood control operations and releases at their John H. Kerr flood control project, got underway in 2005.

Refuge staff continue to participate in various task group meetings ranging from downstream ecosystem, water quality, and recreation, to channel morphology. It is in these task groups that issues are being discussed and studies are designed to address them.

INTRODUCTION

The Roanoke River National Wildlife Refuge (Refuge) was established 10 August 1989, to protect and enhance wooded wetlands consisting of bottomland hardwoods and swamps with high waterfowl value along the Roanoke River (River). The Refuge acquisition boundary involves wetlands in a 130-mile section of the River from the fall line in Weldon downstream to the Albemarle Sound near Plymouth, North Carolina. This area of floodplain encompasses approximately 150,000 acres (235 square miles) of which 33,000 acres are in the Refuge acquisition boundary. Current Refuge acreage totals 20,978. North Carolina Wildlife Resources Commission (NCWRC) acquisition totals approximately 26,000 acres. Both agencies' lands are managed as a joint venture, between the U.S. Fish and Wildlife Service and NCWRC, with the exception of a 45-acre fee title easement in Nash County. The Refuge headquarters office is located in the Town of Windsor in Bertie County, North Carolina.

The portion of the Refuge along the River includes part of an extensive wetland ecosystem that contains excellent examples of a number of southeastern plant communities. These are grouped into three natural community types: levee forest, cypress-gum swamp, and bottomland hardwoods. The 45-acre Nash County satellite includes a beaver impounded stream with button bush cover. The 129-acre Sampson County satellite consists of pocosin wetlands.

The River floodplain is relatively narrow from Weldon to Scotland Neck, at times only a mile in width, with natural levees and ridges alternating with sloughs and backswamps in rapid succession. Current Refuge acreage does not include lands in this upper River reach. In the middle section of the lower River, the floodplain becomes flatter and broader, commonly reaching a width of two to three miles, with cypress-gum backswamps increasing in size. The continued presence of levees and ridges make this stretch of floodplain the most diverse and, potentially, the most productive. There are 15,000 acres of Refuge lands in this lower-middle River reach. Below Jamesville the River is essentially at sea level and broad expanses of cypress-gum swamp, as much as five miles across, predominate. In addition to the major vegetation communities described above, occasional oxbow lakes, beaver ponds, and blackwater streams are located throughout and add to the rich mosaic of habitat types in the River's floodplain. Together, these habitats support a rich array of diverse and abundant fish and wildlife species. A total of 6,000 acres in this River reach are designated Refuge lands.

The River floodplain includes some of the more valuable wetlands for fish and wildlife. Fourteen species of waterfowl regularly utilize the floodplain's wetlands. Wood ducks, mallards and wigeon are the most abundant. Other frequently observed species are black duck, pintail, gadwall, green-winged teal, blue-winged teal, ring-necked duck, hooded merganser, shoveler, bufflehead, Canada goose, and tundra swan.

At least 214 species of birds, including 88 breeding resident and migratory species, utilize the River's floodplain. The area supports the highest density of nesting birds, especially

songbirds, anywhere in North Carolina. The project area has several rookeries that contain great blue herons, snowy and great egrets, anhingas, and yellow-crowned night herons.

The River, its tributaries and associated floodplain wetlands, provide critical habitat for a diversity of fish species, including anadromous fish. Anadromous fish utilizing the system are striped bass, blueback herring, alewife, hickory shad, and American shad. The status of the endangered shortnose sturgeon is unknown.

The River's floodplain also has a high density of white-tailed deer. A remnant population of black bear exists along the lower River. Gray squirrels and marsh rabbits are abundant. Resident furbearers include raccoon, mink, muskrat, otter, fox, bobcat, beaver, and opossum.

The River's bottomland hardwood habitat supports one of the largest natural wild turkey populations in North Carolina. The prime bottomland hardwood trees on the ancient river ridges and terraces provide excellent food and cover for feeding and nesting turkeys. Limited woodcock also occur along the River. Bobwhite quail occurred in some of the bottomland hardwood habitats in the early 90's, but have not been heard since approximately 1995.

Historical economical uses have been commercial fishing and logging. Logging operations were aimed primarily toward harvesting cypress and green ash. Some cypress-tupelo swamps have been changed to mainly tupelo with a few scattered cypress. Some areas have only small quantities of the ash component. Recreational uses are primarily hunting and fishing.

The Refuge also administers 66 conservation easements consisting of approximately 116 sub-tracts, totaling 2,862 acres. These easements are located in 19 counties, some as far away as 200 miles from Refuge headquarters. The easement and private lands programs were elevated in 1996 with the addition of one staff position, a Private Lands Biologist. When the Private Lands Biologist transferred in 2001, the position was moved to the U.S. Fish and Wildlife Service Wildlife Habitat Management Office, Manteo, NC; however, the easements remained the responsibility of the Refuge. These parcels are generating ever-increasing demands. Shortfalls in staffing have placed the easements as a low priority.

Farm Service Agency (old FmHA) lands inventory also generated two fee title tracts totaling 174 acres; 45 acres in Nash County and 129 acres in Sampson County. There has been minimal management of these satellite areas. These small satellites, 100-200 miles from the Refuge headquarters, create many unique problems.

HIGHLIGHTS

- RM Chappell transferred to Texas, Matt Connolly transferred to us from Vieques
- Refuge staff continued day-to-day operations under a series of Acting Managers from May – November while awaiting the hire of a new manager after RM Chappell transferred.
- BioTech hired
- Field Information Technology Specialist hired. Position is based in Columbia at the Migratory Field Office, work area will be eastern North Carolina, and will be supervised by the Refuge.
- Previously reported encroachment activities (a breached wastewater lagoon) on the easement in Orange County (13C) was handed over to LEZO Mike Canada to determine the next steps.
- Refuge staff still continue communication with Realty personnel regarding obtaining a legal right-of-way into the Town Swamp Unit.
- WB Richter continued to work with TNC, USACOE, DG, and NC and VA State officials regarding flow issues on the Roanoke River.

Digital 04-15-2009 JR

During their 2008 annual eagle's nest aerial survey NCWRC found a bald eagle nest on Company Swamp. WB Richter, on foot, located the nest and confirmed that it was active. Staff knew it was only a matter of time before a nest would be established on Refuge lands!

Climatological Review – 2009

Temperatures (in Fahrenheit)
Average high: 70.16
Average low: 50.21
Highest recorded: 97.80 (August)
Lowest recorded: 9.80 (January)

Precipitation (in inches)
Total for the year: 42.70 30 yr average: 47.28

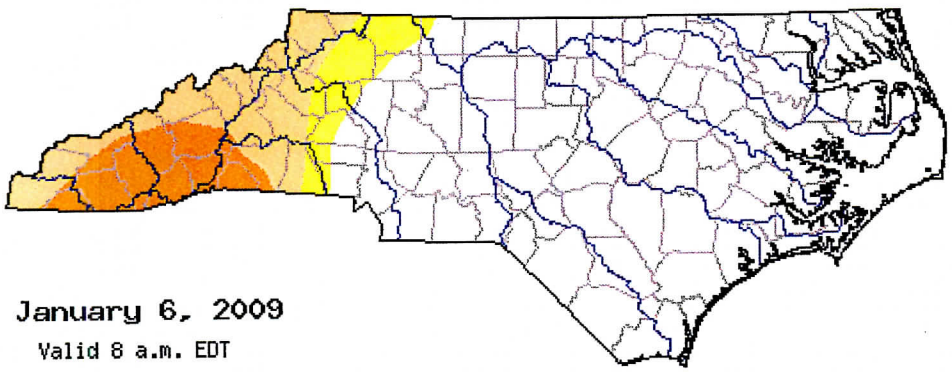
Data was recorded at the Peanut Belt Research Station in Lewiston, NC, which is approximately 20 miles from Refuge headquarters, and obtained from the State Climate Office of North Carolina. All data (100%) was available for 2009.

Data at Lewiston records 3 snow events for the year; 3.5" on January 20th and trace amounts on February 4 and March 1-2. As in previous years, temperatures varied considerably with a low of 9.8 degrees on January 17 followed by a high of 56.6 degrees days later. Temps in January was slightly warmer than last year, averaging a maximum of 47 degrees, with two days in the low 70's. January averaged the coldest maximum temperatures (32 degrees), but temps did reach 72.10 degrees on the 28th. March heralded the arrival of Spring with high's reaching 81.6 on the 9th. This year the end of summer had the highest temperature reaching 97.8 degrees on August 10th. September had the lowest with 51.8 on the 29th.

North Carolina experienced various degrees of drought condition during 2009. Western North Carolina began the year under severe drought conditions before easing into normal conditions by years' end. The eastern part of the state ranged from moderate drought, to abnormally dry, ending with normal conditions. Precipitation averages ranged from a low of .81 inches rainfall in October to a high of 6.61 inches in November, with 3.15 inches occurring on the November 12th.

Month	Precipitation
January	2.28
February	1.67
March	6.07
April	1.21
May	2.07
June	3.49
July	5.32
August	4.09
September	3.25
October	0.81
November	6.61
December	5.83
Total	**42.70**

US Drought Monitor of NORTH CAROLINA



January 6, 2009

Valid 8 a.m. EDT

Drought Classifications

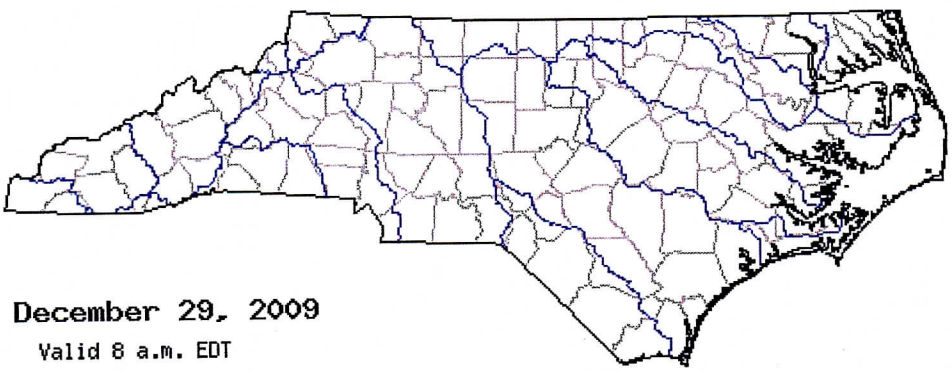
- D0 - Abnormally Dry
- D1 - Moderate Drought
- D2 - Severe Drought
- D3 - Extreme Drought
- D4 - Exceptional Drought

County Boundaries Major River Basins (View Map)

Hi-Resolution Image

The U.S. Drought Monitor focuses on broad scale conditions. Information provided for North Carolina is relative to the information provided from all other states and the North Carolina Drought Management Advisory Council. Local conditions may vary.

US Drought Monitor of NORTH CAROLINA



December 29, 2009

Valid 8 a.m. EDT

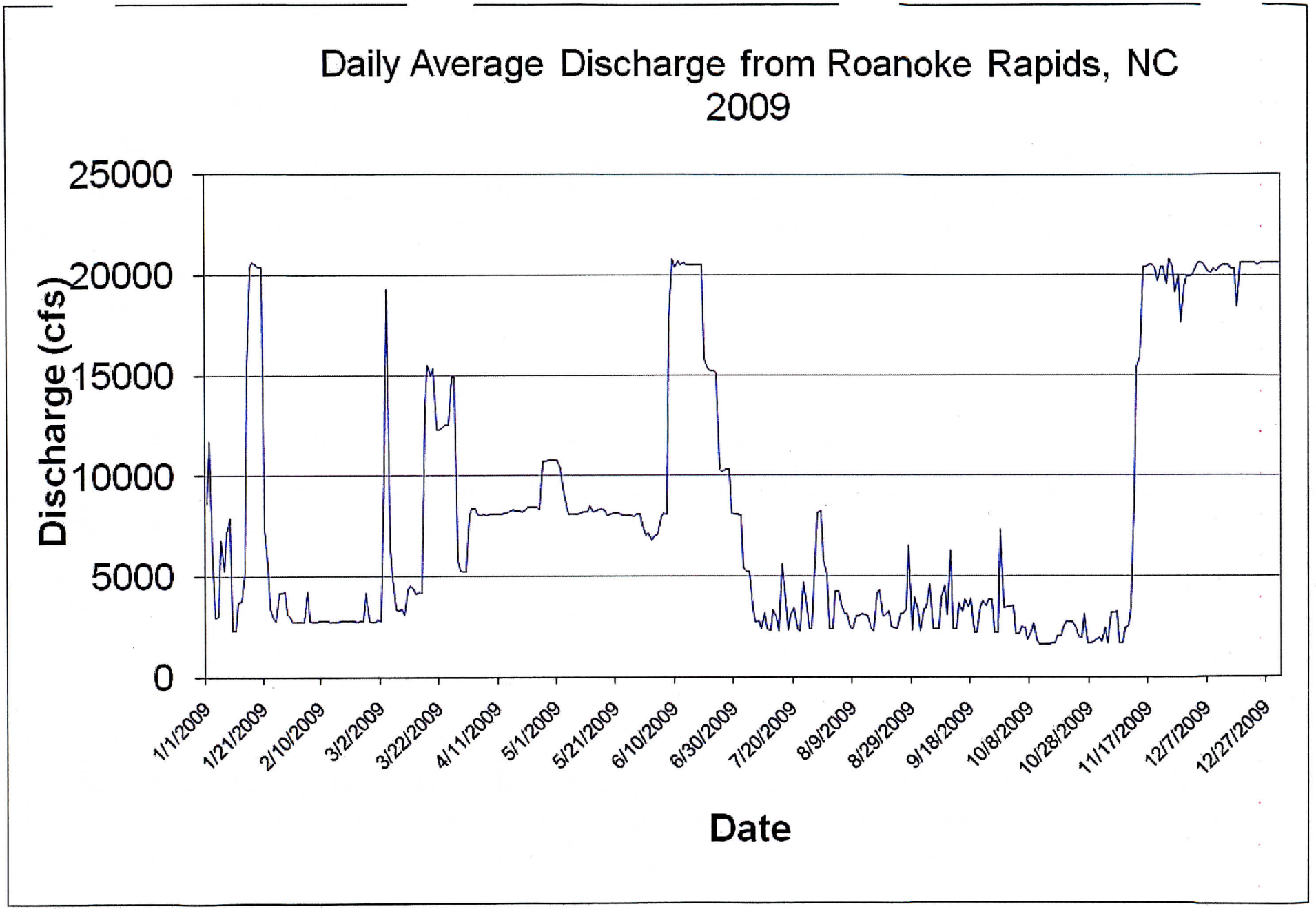
Drought Classifications

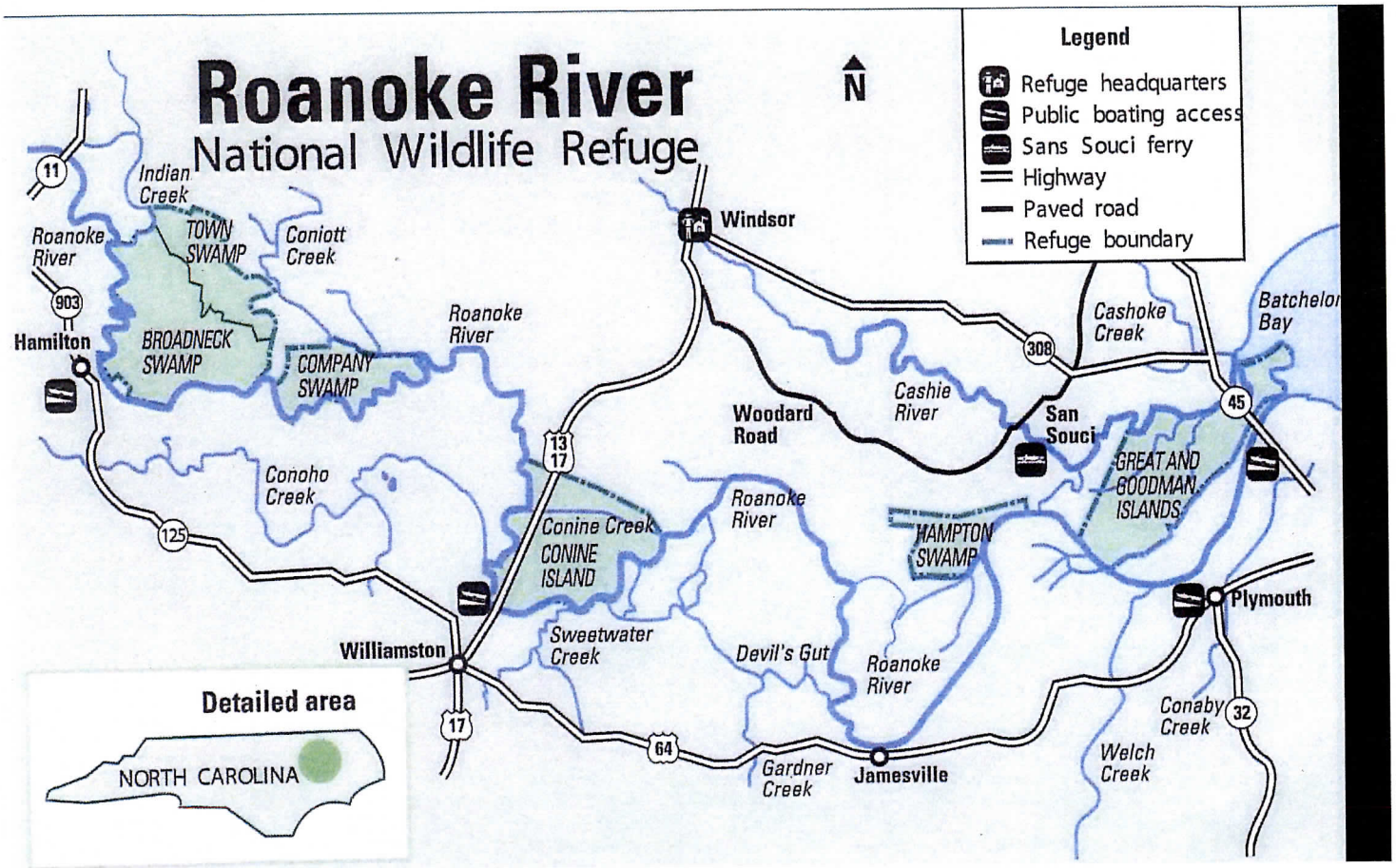
- D0 - Abnormally Dry
- D1 - Moderate Drought
- D2 - Severe Drought
- D3 - Extreme Drought
- D4 - Exceptional Drought

County Boundaries Major River Basins (View Map)

The U.S. Drought Monitor focuses on broad scale conditions. Information provided for North Carolina is relative to the information provided from all other states and the North Carolina Drought Management Advisory Council. Local conditions may vary.

The images above were copied from the archives at http://www.ncdrought.org/archive/index.php.


Daily Average Discharge from Roanoke Rapids, NC
2009
Discharge (cfs)
25000
20000
15000
10000
5000
0
1/1/2009
1/21/2009
2/10/2009
3/2/2009
3/22/2009
4/11/2009
5/1/2009
5/21/2009
6/10/2009
6/30/2009
7/20/2009
8/9/2009
8/29/2009
9/18/2009
10/8/2009
10/28/2009
11/17/2009
12/7/2009
12/27/2009
Date


Roanoke River
National Wildlife Refuge
N
Legend
Refuge headquarters
Public boating access
Sans Souci ferry
Highway
Paved road
Refuge boundary
Indian Creek
Roanoke River
TOWN SWAMP
Coniott Creek
BROADNECK SWAMP
COMPANY SWAMP
Roanoke River
Hamilton
Windsor
Cashoke Creek
Batchelor Bay
Cashie River
Woodard Road
San Souci
GREAT AND GOODMAN ISLANDS
Conoho Creek
Conine Creek
CONINE ISLAND
Roanoke River
HAMPTON SWAMP
Plymouth
Williamston
Sweetwater Creek
Devil's Gut
Roanoke River
Conaby Creek
Welch Creek
Gardner Creek
Jamesville
Detailed area
NORTH CAROLINA
11
903
125
13
17
64
308
45
32

1

Monitoring and Studies

1a. Surveys and Censuses

Notable wildlife occurrences at Roanoke River National Wildlife Refuge (Refuge) in 2009:

- A total of 73 wood ducks were banded this year.
- This was the last of four field seasons for a study looking at the productivity of the Swainson's warbler population in the middle reach of the Roanoke River (River).
- A pair of bald eagles nested again this year on the Company Swamp tract.
- The large woody debris study is well underway, with higher flows this year tagged wood has been mobilized and data collected.

Monitoring Wood Duck Productivity – An overall summary of productivity is outlined followed by a more detailed summary of box clusters below in Table 1. The overall productivity of wood duck boxes was similar to last year. A total of 582 eggs were produced in 40 boxes with 292 eggs hatched as compared to 511 eggs produced in 2008 in 32 boxes in which 296 hatched. In an effort to reduce the occurrence of prothonotary warblers building their nests in wood duck boxes, 12 nest structures were given to the Refuge by Dr. Eugene Hester. The structures consist of a Metamucil container with its top, painted black and an entrance hole drilled in the front. Holes were drilled in the bottom for drainage and on the back to weave an anchor wire though. WB Richter, along with volunteer Jim Brown, fixed all twelve structures on the back of the poles of those wood duck boxes that had repeat occurrences of warbler use over the years.

Eight boxes remain on the lower River; one broke off the post due to corroding hardware. This box was replaced in the fall, too late to catch this years nesting season. The rest were previously taken down due to problems with dump nesting, corroding hardware, and predator guards. The seven boxes were checked in May and November. Nesting attempts by wood ducks were made in all seven boxes. Dump nests (>20 eggs in a clutch) occurred in only one of the seven boxes this year. The total number of eggs laid was 183, including 112 (61%) hatched and 71 (39%) unhatched. The total number of

eggs hatched this year compared to last year was similar, last year 60% of the eggs laid hatched.

Boxes located on Broad Creek (11 boxes) and Grennell Creek (8 boxes) were monitored and maintained. Of the 19 boxes, 9 (47%) had active wood duck nests with 68 (51%) of the 134 eggs hatched. This compares to last year in which 12 (63%) active wood duck boxes were observed with a total number of 174 eggs laid and 95 (55%) hatched. There were two boxes that contained dump nests (>20 eggs) this year and prothonotary warblers or great crested flycatchers used two of the boxes.

Twelve boxes were checked on Welch Creek. A total of eight boxes were used by wood ducks this year; the same as last year. Boxes were checked in June and November. Data collected indicates 97 eggs were laid with 67 (69%) hatching. Prothonotary warbler nests were found in two of the boxes.

The Eastmost River has nine boxes of which only three were used by wood ducks compared to five last year. Of the 3 boxes used, 63 eggs were laid compared to last year when 47 eggs were laid. The success rate improved to 39 (62%) hatched from last year's 14 (30%) success rate.

WB Richter took advantage of high water this year to access, by canoe, the boxes found in Rainbow slough. A total of 22 wood duck boxes can be found at this location. It had been two years since staff was able to find the time to check and clean the boxes at this location. A total of 13 boxes were used by either wood ducks or hood mergansers. Total number of eggs found were 108, of this 91 (84%) were hooded merganser eggs and only 17 (16%) were wood duck eggs. Of the hooded merganser eggs a total of 26 (28%) hatched and 6 (35%) of the wood duck eggs hatched. A prothonotary warbler nest was found in one box and four boxes had both wood duck and hooded merganser eggs present.

Table 1: Wood duck box productivity data for 2009 on Refuge lands.

	Total Number of Boxes	Total # Boxes Used by Waterfowl	Total # Eggs	# WODU Hatched	# WODU Not Hatched (ND)	# Dead Chicks	Hooded Merganser Nest	Hooded Merganser Hatched	# Boxes with POWA Nests	Dump Nests
Rainbow	22	13	108	6	11	0	65	26	1	0
Lower River	8	7	183	112	71	3		0	1	1
Welch Cr.	12	8	97	67	30	2	0	0	2	1
Eastmost	9	3	63	39	24	0	0	0	1	0
Broad/Grennell Cr	19	9	134	68	66	1	0	0	2	2
TOTAL	**70**	**40**	**585**	**292**	**202**	**6**	**65**	**26**	**7**	**4**

Cerulean Warbler Survey – No survey was conducted this year due to lack of staff time and adequate environmental conditions.

Roanoke River NWR Breeding Bird Point Count Surveys on Levee Habitats – WB Richter conducted point counts on established transects (2 on Broadneck Swamp, 1 on Conine Island, and 1 on Company Swamp) each containing 10 points located 250 m apart. This was the fifth year point count data was collected in the hardwood plantations located on Refuge lands purchased in 2004. Green ash, sycamore, and sweet gum plantations made up the fifteen point count plots in the plantations. Within the next few years plans are to manipulate these plantations to promote more diverse hardwood stands. The point count data will serve as a baseline for comparison after stand manipulation is completed.

Each of the 55 points were visited at which time birds seen or heard within 25 m, 50 m, and over 50 m were recorded at 0-3 minutes, 4-5 minutes, and 6-10 minutes time intervals. The protocol used is based on the Hamel, et. al. "**A Land Manager's Guide to Point Counts of Birds in the Southeast**" and has been adopted with minimal modification by Regions 4 and 5. All points are located 50 m from the River and are in levee habitat. The objectives of this monitoring study are to 1) monitor, overtime, the effects of aseasonal flooding on bird populations; 2) document the density and diversity of birds on the River levees; 3) assist Refuge staff on determining habitat management objectives and priorities for the Refuge; and 4) use the standardized protocol to allow one to compare bird population trends on an ecosystem, regional, and national scale in similar habitat types. The goal is to have a total of 50 points in this one habitat type as

recommended by WB Chuck Hunter, U.S. Fish and Wildlife Service (FWS), Southeast Regional Office.

Table 2 summarizes the 2009 data as it compares to the point count data collected in past years. In reviewing this table, some notable observations are:

- There was not one species that stood out as being significantly more abundant this year than in years past. However, the following species were notably less abundant this year: Eastern tufted titmouse, Northern cardinal, red-bellied woodpecker, and red-eyed vireo. There continues to be an evident downward trend in the number of prothonotary warblers on the levee plots with numbers remaining relatively stable on the plantation plots.
- Listed in order of abundance, the five most abundant bird species counted on levee sites in 2009 were: Carolina wren, American redstart, blue-gray gnatcatcher, Acadian flycatcher, and red-eyed vireo. This compares with last year's abundance of American redstart and Carolina wren tied for most abundant, blue-gray gnatcatcher and red-eyed vireo tied at second, Acadian flycatcher, white-eyed vireo, and Northern cardinal. The average number from previous years (1999-2008) indicates that the five most abundant species were: American redstart, Carolina wren, blue-gray gnatcatcher, prothonotary warbler, and northern cardinal.
- On levee sites, the most widespread species (species with the highest number of occurrences) listed in order of highest to lowest occurrence were: Carolina wren, American redstart, red-bellied woodpecker, and northern cardinal. As compared to occurrence of species tallied from 1999-2008 in which the most widespread species was the Carolina wren, northern cardinal, Acadian flycatcher, American redstart, and prothonotary warbler.
- On plantation sites, the most widespread species (species with highest number of occurrences) listed in order of highest to lowest occurrence were: Acadian flycatcher, American redstart, red-eyed vireo, prothonotary warbler, and Carolina wren. As compared to occurrence of species tallied from previous years (2005-2007) in which the most widespread species was the Acadian flycatcher, Carolina wren, American redstart, prothonotary warbler, and blue-gray gnatcatcher.
- Listed in order of abundance, the five most abundant bird species counted on plantation sites were: American redstart, Acadian flycatcher, red-eyed vireo, prothonotary warbler, and blue-gray gnatcatcher. The average number from previous years (2005-2008) indicates that the five most abundant species were: American redstart, Acadian flycatcher, Carolina wren, blue-gray gnatcatcher and prothonotary warbler.
- The Cerulean warbler usually picked-up on the Company Swamp transect was not present this year giving rise to the growing need to do a survey for this species on the lower River to determine the status of this species in this part of the Roanoke basin.

Table 2: Comparative summary of levee and plantation point count data collected on Refuge lands in 2009 to levee point count data collected from1999-2009.

Species	# Occurrences Levee Sites 2009	Average # Occurrences**/yr. Levee Sites 1999-2008	# Individuals Levee Sites 2009	Average # Individuals/yr. Levee Sites 1999-2008	Occurrences** Hardwood Plantations 2009	Occurrences**/yr. Hardwood Plantations 2005-2008	# Individuals Hardwood Plantations 2009	# Individuals/yr. Hardwood Plantations 2005-2008
Acadian Flycatcher*	36	36.0	53	52.9	14	14.8	21	26.8
American Crow	13	14.9	21	21.6	5	6.8	7	9.5
American Redstart*	37	35.8	70	73.1	13	12.8	39	35.3
Anhinga	1	0.2	3	0.3	0	0.0		0.0
Barred Owl	3	6.0	3	6.9	3	2.5	3	2.8
Black-throated Blue Warbler*	0	0.9		1.1	0	0.0	0.0	
Black Poll Warbler*	0	0.7		0.8	0	0.0	0.0	
Blue-gray Gnatcatcher*	31	32.2	54	67.1	8	9.3	12	16.5
Blue Grosebeak*	0	0.3		0.3	0	0.5	0.5	
Brown-headed Cowbird	12	12.9	12	13.9	2	2.8	5	3.0
Canada Goose	5	1.9	9	4.5	1	1.0	2	2.5
Carolina Chickadee	21	22.4	39	43.5	6	6.5	10	10.0
Carolina Wren	40	36.8	83	69.9	10	12.8	11	21.0
Cerulean Warbler*	0	0.5		0.5	0	0.0		0.0
Chimmney Swift*	3	4.7	6	7.2	0	2.8		5.3
Common Grackle	1	1.9	1	2.6	0	0.3		0.3
Common Yellowthroat	26	13.2	31	15.5	8	7.8	11	10.8
Downy Woodpecker	4	8.9	4	9.4	6	6.5	6	7.0
Eastern Tufted Titmouse	28	30.6	37	46.7	3	8.3	4	9.5
Eastern Wood-Pewee*	15	18.6	15	20.1	3	1.5	3	1.5
Fish Crow	2	2.5	3	2.7	1	0.8	1	0.8
Flicker Integrated	3	5.5	3	6.0	1	1.0	1	1.3
Gray Catbird	0	0.1		0.1	0	0.0	0.0	
Great Blue Heron	0	1.3		1.5	0	0.0	0.0	
Great Crested Flycatcher*	18	23.4	19	28.8	8	5.5	9	6.3
Hairy Woodpecker	3	4.2	4	4.5	0	2.5		4.0
Hooded Warbler*	11	11.3	13	13.4	4	2.8	4	2.8
Indigo Bunting*	13	10.4	16	11.7	5	4.8	6	5.0
Kentucky Warbler*	11	8.4	12	10.0	2	2.3	2	2.5
Louisiana Waterthrush*	0	0.3		0.3	0	0.0	0.0	

Species	# Occurrences Levee Sites 2009	Average # Occurrences**/yr. Levee Sites 1999-2008	# Individuals Levee Sites 2009	Average # Individuals/yr. Levee Sites 1999-2008	Occurrences** Hardwood Plantations 2009	Occurrences**/yr. Hardwood Plantations 2005-2008	# Individuals Hardwood Plantations 2009	# Individuals/yr. Hardwood Plantations 2005-2008
Mourning Dove	9	7.6	11	8.8	2	2.5	3	2.8
Northern Cardinal	32	36.2	41	53.5	9	9.0	11	12.0
Norther Parula Warbler*	11	14.5	19	25.1	0	1.3		1.3
Ovenbird*	10	3.2	12	3.6	4	4.3	7	6.3
Pileated Woodpecker	17	13.8	20	16.4	3	0.8	3	0.8
Prothonotary Warbler*	22	33.8	32	63.1	11	11.0	13	15.5
Red-bellied Woodpecker	33	28.7	44	38.8	3	2.3	3	2.3
Red-eyed Vireo*	35	38.2	51	73.2	12	12.5	20	20.8
Red-shouldered Hawk	5	2.9	5	3.4	1	1.8	1	1.8
Rufous-sided Hummingbird*	1	1.4	1	1.5	0	0.3		0.3
Rufous-sided Towhee	0	0.0	0.0	0.0	3	1.8	4	1.8
Scarlet Tanager*	7	4.2	7	4.7	1	0.8	1	1.0
Summer Tanager*	20	17.2	23	18.8	5	4.8	5	5.0
Swainson's Warbler*	6	7.8	7	9.7	0	1.0		1.0
Turkey Vulture	2	0.6	2	0.6	0	0.0		0.0
White-breasted Nuthatch	14	12.0	17	15.8	1	1.5	1	2.0
White-eyed Vireo	31	29.1	36	36.0	5	5.8	5	7.3
Wood Thrush*	11	17.6	13	22.3	3	3.3	4	4.3
Yellow-billed Cuckoo*	3	11.1	3	13.9	2	5.0	2	6.0
Yellow-throated Vireo*	10	5.6	11	5.8	1	1.0	1	1.3
Yellow-throated Warbler	0	0.3		0.3	0	**0.3**	0.0	0.3
Total		**42.8**	**867**	**963.4**	15	15.0	242	**280.0**

* Indicates neotropical migratory bird species

** An occurrence is whether a species was encountered at a sampling site. On levee sites and plantation sites there were a possible 40 and 15 occurrences respectively in 2009.

Roanoke River NWR Permanent Forest Plots - In 2005 WB Richter collected data on five 40 m X 200 m forest health plots located on the Company Swamp, Conine Island, and Broadneck Tracts of the Refuge. The plots are located in the part of the floodplain that is inundated when discharges from the dam at Roanoke Rapids are a continuous 18,500 cfs or greater for more than five days. It is at this discharge that prolonged flooding during the growing season (commonly mid- to late-spring) occurs and is believed to adversely affect the health of the forests being flooded. There are two types of information being collected from these plots; 1) Monitoring the health of the already established trees, and 2) Monitoring the regeneration and survivorship of tree seedlings. The goal of this study is to monitor the dynamics of the bottomland hardwood forest communities at elevations inundated at flows of 18,500 cfs and document any changes. The objectives of the study, overtime, are to: 1) monitor changes in forest structure horizontally and vertically; 2) monitor the effects of managed flows on forest productivity; i.e., species diversity and tree growth; and 3) monitor survivorship of woody seedlings and saplings over a minimum of five years. In order to connect any of the changes observed over the year to managed flows, reference plots in another similar river system with a run-of-river flow regime must be established. Finding a reference plot nearby has proven to be difficult due to differences in scale of the River compared to other river systems. The Roanoke River is much larger and has a floodplain that is more intact than other nearby rivers. Instead of locating another watershed, a more appropriate reference may be comparing the seedling survivorship data observed over different hydrological gradients along the Roanoke River floodplain with that found in the Dominion Generation hardwood regeneration study.

The protocol used to establish these plots and collect data follows closely with that discussed in a paper published in Castanea 63(3): 262-274; by R. K. Peet, T. R. Wentworth, and P. S. White and is titled "**A flexible, multipurpose method for recording vegetation composition and structure.**" In order to track the health of the mature trees each tree was given an individual number and data on overall tree health, height, and diameter was collected when the plots were first established in 2000 and 2001. In 2004 and 2005 a special effort was made to collect data on the large trees from each plot in order to assess the damage the prolonged flood event of 2003 had on the trees. The results of this effort were described in the 2006 Annual Narrative. Another attempt will be made to collect similar data in 2010. Data on tree health will be compared with previously collected data to look at overall changes in vegetation within and between plots and extrapolated to the surrounding bottomland forest community, where appropriate. Nested within each large 40 m x 200 m plot are twenty 1 m x 1 m seedling plots making a total of 100 on the floodplain. The seedling plots were established to monitor survivorship and productivity of different tree species. Data on ground cover, canopy cover, and presence of other species is recorded for each plot. This was the tenth year data on all seedling plots (5 x 20 = 100 seedling plots) was collected.

Digital 09-24-2009 JR

After being underwater for 14+ days this laurel oak seedling died back. Although most, at this young age, will not recover from a flood such as this, some will make a comeback either later in the season or next year.

Digital 09-24-2009 JR

Signs of life after being flooded for 14+ days; it appears this trumpet vine flower delayed leaf out until after the flood waters receded.

Digital 09-24-2009 JR

Another sign of life, this young American elm seedling made it through the 14 day flood in June.

Roanoke River NWR Reptile and Amphibian Survey - A total of 51 plots were established in 2005 with each plot consisting one 2' x 4' sheet of tin, one 2' x 4' sheet of plywood, and one 1½ " pvc pipe. Plots are concentrated on the Town Swamp, Broadneck, Rainbow, Company Swamp, and Conine Island tracts. The plots are located on various floodplain features including: levees—21 plots; hummocks (high points, thought to be old dredge spoil piles, located on the levees)—3 plots; high ridges—8 plots; plantations (pine and hardwood)—11 plots; and bottomland flats (Patuxent study plot on the Roanoke)—8 plots. Of the 51 plots established, only 33 were checked. Time constraints prevented WB Richter from visiting all the plots but when other work duties took WB Richter in the vicinity of a plot it was checked. As a result, the 23 plots checked were checked over the months of May, June, and July. BT Railey rechecked 8 of these plots (in Town Swamp) in Oct/Nov of 2009. Results of this limited survey can be found in Table 3. Beginning next year, BT Railey will take over monitoring the herp plots at which time site locations of plots will be evaluated to determine if a plot should be abandoned or relocated. Data is summarized in Table 3.

Table 3: Data collected from herp inventory plots on Refuge lands 2005 through 2009.

River Feature	Species	Species Observed May 2005	Species Observed May 2006	Species Observed May 2007	Species Observed May 2008	Species Observed May – July, + Fall 2009
Levee	Worm snake	1			1	1
	Gray tree frog	3	1	4	1	
	Green tree frog	2		2	1	
	Squirrel tree frog			1	1	
	Marbled salamander	1 near plot		3		
	Rough green snake					
Ridge	Marbled salamander	1		4		
	Green tree frog		6	1		
	Slimy salamander		3	3	2	
	Squirrel tree frog			1		
	Worm snake		2			1
						1
Plantation	Slimy salamander	3	1	7	1	6 + 1 (Fall)
	Green tree frog	2	1		1	1+ 4 (Fall)
	Marbled salamander	1			1	1 (Fall)
	Spade foot toad		1			
	Squirrel tree frog		2			
	Gray tree frog		1	2		2 (Fall)
						2 + 2 (Fall)
Bottomland Flat	Red-bellied water snake	1 near plot				
Hummock	Worm snake	1				
	Gray tree frog			2		

1b. Studies and Investigations

Roanoke River NWR "The Effect of a Managed Flow Regime on the Bank Morphology of the Roanoke River NWR" (02-42630-03) - One of the concerns the FWS has voiced to Dominion Generation (DG) during the FERC relicensing is the effects peaking flows and peaking flows piggy-backed on flood control flows have on bank stability in addition to the prolonged high flows associated with the U.S. Army Corps of Engineers (USACOE's) flood control project. The objective of the study is to measure changes in erosion and deposition at selected sites along the River between Weldon to just upstream of Jamesville, NC, and determine whether any observed occurrences can be associated with DG load following releases and/or USACOE flood control releases. Fluvial geomorphologist and Research Ecologist Dr. Cliff Hupp, US Geological Survey (USGS), Reston, VA, has been designated as the principle investigator to look at the effects of the managed flow regime on bank and bed morphology which is being funded by the USACOE via the Section 216 study. WB Richter is a designated collaborator on this study. A final open-file report has been published for this study; the reference is as follows: Schenk, E.R.; Hupp, C.R.; Richter, J.M.; and Kroes, D.E. 2009, Bank erosion, bathymetry, and water clarity along the dam regulated lower Roanoke River, North Carolina, USA. USGS Open File Report 2009-1260, 17 pgs.

The abstract to the citation below follows:

Dam construction and its impact on downstream fluvial processes may substantially alter ambient bank stability, floodplain inundation patterns, and channel morphology. Most of the world's largest rivers have been dammed, which has prompted management efforts to mitigate dam effects. Three high dams (completed between 1953 and 1963) occur along the Piedmont portion of the Roanoke River, North Carolina; just downstream, the lower part of the river flows across largely unconsolidated Coastal Plain deposits. To document bank erosion rates along the lower River, more than 700 bank erosion pins were installed along 124 bank transects. Additionally, discrete measurements of channel bathymetry, water clarity, and presence or absence of mass wasting were documented along the entire 153-kilometer-long study reach. Amounts of bank erosion in combination with prior estimates of floodplain deposition were used to develop a bank erosion and floodplain deposition sediment budget for the lower river. Present bank erosion rates are relatively high [mean 42 millimeters per year (mm/yr)] and are greatest along the middle reaches (mean 60 mm/yr) and on lower parts of the bank on all reaches. Erosion rates were likely higher along upstream reaches than present erosion rates such that erosion rate maxima have migrated downstream. Mass wasting and water clarity also peak along the middle reaches.

Since all the transects with pins are still in place, Dr. Hupp will continue to measure the pins when time and resources permit (at least annually) in an effort to make the dataset more robust. This concludes the reporting of the USGS portion of the bank erosion study in the annual narratives unless some unusual trend begins to emerge.

In addition to the USGS study, a study being carried out by VA Tech continues to look at the affects of DGs peaking operations on bank stability. The results of their work to date can be found under ***Section 5(a)1 Interagency coordination***.

Roanoke River NWR "The Effect of a Managed Flow Regime on the Bank Vegetation" (unnumbered) - The dry spell that lasted from 2000-2002 prevented DG from peaking during the year and the USACOE did not go into flood control mode. As a result, a nice blanket of vegetation became established on the banks. Numerous young trees over 1 m in height were present along with a dense cover of herbaceous perennials and annuals. WB Richter and Jeff Horton, TNC, Roanoke River Project Office, designed a study that will monitor the impacts of future water flows on the vegetation found on the banks and that will also examine the rates of bank erosion. In September and October 2002 thirteen bank erosion/vegetation transects were established. The first transect is located just downstream of Weldon and the last transect is located just downstream of Conine Island. Each transect consists of a plot opposite the other along the River. The plots run 10 m parallel with the River and the width of each plot varies as it runs from the height 20,000 cfs would be on the bank to the River. Nested within the plot on the upstream side are 1 m square plots running the width of the plot starting at the 20,000 cfs flow line to the River. For each meter square plot, data on percent cover of woody and herbaceous vegetation was recorded and in some plots percent cover of each species was recorded in addition to percent cover of herbaceous and percent cover of woody plant material. Photos were taken of each meter square plot to be used as a reference. In the center of each meter square nested plot was placed a metal pin flush to the ground to monitor erosion. The upper corners of each plot were marked with a metal stake for easy relocation. Within the larger 10 m X (length of width) plot, the number of trees between 1 m and 4 m were recorded. A photo was taken of the entire plot and upstream and downstream of each plot. To date only the plots have been established and preliminary data collected. No data was collected in 2003 and 2004. With the help of 2005 Summer Intern Kelly Taylor, all plots were visited, pins located and measured, dead and live trees tallied, and photos of the plots taken. Photos are organized in the office photo computer and data has been entered in a spreadsheet; due to lack of time no report has been produced.

Roanoke River NWR "Roanoke River Tree Ring Analysis" (03-42630-01) - In 1999, as part of Ms. Hochman's research project, tree cores were extracted from large trees in or next to the permanent forest health plots. Target trees were green ash, American elm, laurel oak, and overcup oak. All cored trees were present on the floodplain before the dams were built. The objective of this study is to determine if a growth pattern exists that indicates reduced rates of growth since the River's hydrology was altered in 1953. Dr. Tom Yanosky, USGS, Dendrochronologist, Reston, Virginia, is the primary investigator. All cores have been measured and the dendrochronolgy analysis is underway. In addition, 30 green ash (*Fraxinus pennsylvanica*) were cored in 2005. The core samples from the green ash have been analyzed and it was found that green ash seem to go very well in flooded conditions. In fact, the largest growth ring was observed in 2003, the year the trees were inundated throughout the entire growing season. In March, WB Richter traveled to Reston, VA to discuss the project with Dr. Yanosky. It was

decided that oaks should also be looked at. WB Richter agreed to core 13 laurel oak (*Quercus laurifolia*) trees and send the cores to Dr. Yanosky's lab for analysis. A preliminary analysis of the cores has been carried out; WB Richter is waiting for the final results. Since Dr. Yanosky is now retired from the USGS, a significant amount of time lapses before information is made available as Dr. Yanosky is dealing with several family issues. WB Richter is going to look into trying to get Dr. Yanosky to transfer the data to Dr. Tom Doyle, Ecologist, USGS, National Wetlands Research Center, Lafayette, LA. It is hoped that next year the cores can be adequately analyzed and this project can come to a close.

Roanoke River NWR "Investigating Influences on Swainson's Warbler Nest Survival in a Bottomland Hardwood System Subjected to Asynchronous, Aseasonal Flooding" (04-42360-01) - The objectives of this study are to collect productivity, habitat utilization behavior data on the Swainson's warbler. To do this, Swainson's warbler nests were continuously monitored with infrared video cameras and adult birds were fitted with radio transmitters. If a significant managed flood event occurs during the field season it is hoped that a comparison of flood years to non-flood years could be made to determine if the altered flow regime impacts the foraging behavior and productivity of the species. As the study progressed, another objective was developed to look at the occurrence of extra-pair paternity in the mating system of the Swainson's warbler. This is a phenomena that is being revealed with several different, thought to be strictly monogamous, passerines; the Swainson's warbler is thought to be one.

In 2005, Dr. Lancia, Professor of Wildlife Science, NCSU, recruited a PhD student, Neil Chartier, for this project. Mr. Chartier was awarded a special scholarship that covers tuition and provides a stipend for living expenses throughout the year. Mr. Chartier came from Eastern Michigan University where he received his MS degree. WB Richter has agreed to be a technical advisor on Mr. Chartier's graduate committee. The Refuge provided a vehicle and two boats as needed. For a summary of the collaborators on this study and history of funding refer to the 2007 Annual Narrative.

This was the fourth and final field season of this study; a final report is due in late 2010 or early 2011. A summary of the 2009 field season can be found below.

Interim report for field work investigating the breeding biology of the Swainson's warbler along the Roanoke River, North Carolina (2009)

Neil Chartier, North Carolina State University, Fisheries and Wildlife Sciences Program

Field work began in mid-April 2009 at the Roanoke River National Wildlife Refuge, North Carolina, and continued through 31 July 2009. During the 2009 field season, 45 Swainson's warbler (SWWA) nests were monitored. Preliminary results indicate 27% apparent nest survival (12/45). Twenty-four SWWA young fledged from 12 nests (average two young fledged per successful nest).

Of the 45 total nests monitored, infrared video cameras continuously monitored 42 nests. Three nests failed before cameras could be deployed. Among nests with known outcomes, black rat snakes depredated 16 nests (38%), which accounted for 55% of all known nest failures ($n = 29$). Five nests were abandoned, of which three were likely the result of researchers putting radio transmitters on incubating females. Two nests with nestlings failed (one with two nestlings and one with four nestlings) when the nestlings died of unknown causes. A corn snake depredated one nest (likely the first record for this species as a SWWA nest predator). What is thought to be an Eastern screech owl depredated one nest. There was an 11% rate of Brown-headed cowbird parasitism and one nest was abandoned after three unsuccessful Brown-headed cowbird attempts to parasitize the nest. One-hundred and twenty-seven SWWA were captured (see Table 4 for summary). Radio telemetry was used on 42 birds (males $n = 28$, females $n = 14$)

During fall 2008 and winter 2008-2009, North Carolina State University Ph.D. Candidate Neil Chartier, who has a 2007-2009 Hofmann Fellowship from NCSU, refined his dissertation research. Eight-hundred video tapes have been reviewed for depredation events and interspecies interactions. In addition, parental behaviors were recorded and quantified (e.g., duration of times for incubation, brooding, provisioning, nest guarding). Twenty-two refurbished radio transmitters were ordered in November 2008 and delivered by April 2009.

Four field technicians (including one North Carolina State University Fisheries and Wildlife Sciences Program intern) were hired by March 2009.

Field work began 27 April 2009. The first nests were found in early late April 2009 and the first infrared video cameras were deployed. By late June 2009, 27 nests had been monitored to completion. Preliminary results indicate 26% apparent nest survival (7/27). Fifteen SWWA young had fledged from 7 nests (average 2.1 young fledged per successful nest). Seven nests are currently being monitored.

Of the 27 nests monitored to completion, infrared video cameras continuously monitored 23 nests. Four nests failed before cameras could be deployed. Among nests with known outcomes, black rat snakes depredated 9 nests (39%), which accounted for 56% of all known nest failures ($n = 16$). Brown-headed cowbirds parasitized 11% of the nests ($n = 3$) and partially depredated 11% of the nests ($n = 3$). One nest was abandoned, likely due to flooding.

By late June, 62 SWWA had been captured (see Table 4 for summary). Radio telemetry has been used on 19 birds (males $n = 12$, females $n = 7$). Field work will continue through 31 July 2009.

Table 4. SWWA banding summary at Roanoke River National Wildlife Refuge, NC 2006–2009.

SWWA	2006 new	2006 recaptures in 2007	2006 recaptures in 2008	2006 recaptures in 2009	2007 new	2007 recaptures in 2008	2007 recaptures in 2009	2008 New	2008 recaptures in 2009	2009 new	Total
Male	32	17 (53%)	10 (31%)	5 (16%)	15	7(47%)	2 (13%)	19	5 (26%)	5	71
Female	11	3 (27%)	2 (18%)	1 (9%)	10	3 (33%)	3 (30%)	31	7 (23%)	4	56
Hatch-year	12	-	-	-	34	2 (6%)	-	53	3 (6%)	27	126
Total	55	20 (36%)	12 (22%)	6 (11%)	59	12 (20%)	5 (8%)	103	15 (15%)	36	253

Digital 06-05-2009

A 14+ day flood occurred during Swainson's warbler nesting season. NCSU Doctorial Student Neil Chartier is hoping this flood event might turn up some interesting findings during his final field season on the Refuge.

Digital 06-25-2009

Summer field technician Samantha Collins places a unique set of color-coded bands on a Swainson's warbler captured in a mist net. These bands will identify the bird after it has been released.

Digital 06-05-09

Pictured above is a Swainson's warbler nest with eggs that have successfully hatched before a snake got to them. Let's hope they make it to fledgling status.

Roanoke River NWR "The Dynamics of Woody Debris on the Coastal Plain Reach of the Roanoke River, North Carolina, and its implications for Aquatic Resources" (07-42360-01) - The principle investigator for this study is Dr. Cliff Hupp, USGS, Reston, VA. The subject expert is Dr. Bertrand Moulin, who resides in France, and collaborators are WB Richter and Mr. Ed Schenk, USGS, Reston, VA. Dr. Moulin has studied the dynamics of large woody debris on coastal rivers in France and has agreed to bring his expertise on woody debris to the River. The study will look at how different flow regimes (flood control or hydropower peaking) effect the movement and generation of large woody debris (LWD) in the coastal plain reach of the River. In 2006 WB Richter and Dr. Hupp submitted a Science Support Partnership funding proposal to compete for USGS funds. In 2007 the project was funded for four years receiving an average of $22,500 per year.

The objectives of the study include the determination of:

- The spatial distribution within the channel of forms and volumes of LWD accumulation.
- The characteristics of LWD in transit and its temporal and geographical origin.
- The residence time of LWD in the River.
- The main transport mechanisms of LWD; i.e., hydropower peaking and/or flood control operations or none of the above.
- The development of a LWD budget and the prediction of the future of LWD budgets based on various management scenarios through modelling.

The goal of this work is to better understand spatial and temporal dynamics of LWD in large coastal plain rivers, specifically the Roanoke River in northeastern North Carolina from downstream of the dams to the Albemarle Sound (137 miles). The first step involved reviewing the video footage of woody debris obtained though the USACOE 216 Study and determine the spatial distribution, volume, and forms of woody debris within the channel. With an idea of distribution and types of LWD, pieces will be tagged with tracking devices. Locations of the woody debris will be checked periodically and movement will be correlated to flow releases.

The second part of this project will be to develop a LWD budget for the aquatic ecosystem. Volumes of LWD that are already present and/or potential in the River will be quantified. This will be based on rates of bank erosion Hupp et. al. determined in the Schenk et. al. study described above, and on the volume of trees on the levee, the geomorphic feature most susceptible to erosion. A predictive model of LWD will be constructed based on the information and the current hydrologic regime. The model will estimate the production, storage, and sources of LWD in the River based on dam releases. It is anticipated that the results of the proposed study will have broad application throughout the Atlantic and Gulf Coastal Plain. The project is scheduled to be completed December 2011, contingent upon flood events.

Progress made this year: WB Richter and Ed Schenk continue to tag trees as time permits. This year approximately 70 new tags were placed in woody debris. Mr. Schenk came down in August to relocate pieces of debris after a two week high water event in June and implanted more tags in woody debris. Dr. Moulin, Dr. Hupp, and Mr. Schenk came down in November to implant tags in more trees. The River was at flood stage. Tags were placed in pieces of woody debris that were easily accessible and that met the criteria. Also, numbered aluminium tags were placed in large pieces of woody debris actively moving and then relocated a few days later to determine transport rates during flood events.

Digital 11-18-9

Dr. Cliff Hupp and a Field Technician have just finished tagging large pieces of woody debris. They hope to take advantage of the high flows in measuring the rate of movement.

Digital 11-18-09

A log jam, just upstream, broke loose allowing for some important data collection on the rate of movement.

Roanoke River NWR "The Effects of Artificial Canopy Gap Creation on the Growth and Development of Bald Cypress Advanced Regeneration on the Lower Roanoke River Floodplain, NE NC" (08-42360-01) – The overarching goal of this project is to determine the feasibility of restoring bald cypress back into canopy-level dominance in specific areas by significantly increasing available light to already-established bald cypress saplings via the creation of artificial gaps in the canopy. Though some research has been conducted on the effects of increased light and decreased competition via thinning on residual adult bald cypress growth as well as the effects of varying light levels on young seedling growth, essentially no work has been done on the effects of increased light (release) on understory bald cypress saplings, especially when potentially stunted for long periods of time. These artificial canopy gaps would be created by killing overstory water tupelo trees (by girdling and herbicide injection) directly overtopping saplings within a local area. If the initial (first two growing seasons) growth response of bald cypress saplings is significantly positive, and continued yearly monitoring shows continued growth of at least a moderate pace, the herbicide treatment conducted on experimental plots (and possibly other areas of the Broadneck tract) may be more widely applied throughout the Refuge where current bald cypress advanced regeneration exists.

A secondary project goal is a clearer understanding of the dates of past logging operations and a more thorough understanding of how past logging operations and continuous dam flow management regimes have affected the forest's development and individual tree growth.

This study primarily intends to examine the growth-response of bald cypress saplings to canopy gap creation. However, as mentioned above, there are several secondary avenues of research. Specific objectives of this study are listed below:

- To determine the rate of initial (first and second growing season) growth response of bald cypress advanced regeneration to significantly increased light conditions from artificial canopy gap creation. Growth and mortality response will be evaluated across sapling size and density gradients, as well as in reaction to initial overstory composition.
- To determine, using dendrochronological techniques, ages and past rates of growth of adult, overstory water tupelo in response to various environmental conditions and large scale alterations to local hydrologic regime (*i.e.*, dam building). If adequate hydrologic data is available, hydrologic conditions at the time of establishment for the present canopy trees will be evaluated.
- To determine, using dendrochronological techniques, ages and past rates of growth of adult, canopy bald cypress trees in an effort to determine an estimate of the general number and ages of cohorts on the floodplain and to similarly examine the species' response to local hydrologic regime (if adequate hydrologic data is available) and dam building.
- To monitor/examine current growth rates of bald cypress saplings in naturally existing gaps of various sizes.
- To utilize the above information in an effort to determine the feasibility of restoration of bald cypress into the forest canopy over significant acreage via

release of existing advanced regeneration (of various sizes and densities) through artificial canopy gap creation.

- To utilize the above information in an effort to generally contribute to the overall knowledge concerning the effects of dam flow management on floodplain ecosystems.

METHODOLOGY

Basic Design – In order to clearly understand the effects of increased light on bald cypress sapling community growth and development, both treatment and control plots are necessary. These plots should capture the existing range of variation in terms of sapling size and density. A paired plot sampling design has been chosen, with each pair to contain a treatment plot in which all non-bald cypress woody vegetation will be girdled and injected with a herbicide and a control plot in which no treatment will be conducted. The herbicide *Habitat* has been chosen as it has proven effective for killing large water tupelo trees in past studies. In order to create gaps in the canopy large enough to provide significantly increased light (full sunlight for many hours each day) and to prevent canopy re-closure, plots are to be 19 x 24 m in size. All non-bald cypress woody vegetation 1.37 m tall or larger rooted in treatment plots will be killed, as will all non-bald cypress woody vegetation outside the plots which shades any portion of the plots from direct overhead light. Initially, treatment and control plots will be generally paired based on relatively close location (i.e., similar hydrology – no plots further than 0.4 km apart, most 60—100 m apart) and similar bald cypress sapling density and size characteristics. Any individual treatment and control plots will be kept at least 40 m apart to avoid edge effects on the control plots from artificially created canopy gaps in treatment plots. Fourteen pairs of plots have now been established. Target tupelo trees were treated in November of 2008.

During the growing season this year the majority of the trees that were injected died. However, there were a few that leafed out that will most likely eventually die; it was decided to treat them again when dormant to hasten their death. In general, enough trees were killed to eliminate canopy cover to enable the study continue. Observations from the first growing season after treatment have shown that the cypress saplings do seem to be light stressed. It appears that – at this early stage of the post-release period – small saplings may be responding far more vigorously. Relative growth measures show that there is a strongly significant ($P<.0001$) growth difference between saplings less than 5 cm initially (mean relative growth rate = .135) and those larger than 5 cm (mean RGR = .039). An examination of absolute growth between similarly sized trees in control and treatment plots shows fantastic growth across the board in response to treatment, with little difference between size classes. Growth improvements ranged from a 324% increase (saplings 12-15 cm) to a 590% increase (saplings 6-9 cm). Thus, all diameter classes improved growth tremendously. One of the treatment plots is shown in Figure 1.

A second part to this study was an analysis of tree growth behavior of bald cypress and water tupelo over time in order to determine if the dams have an influence on the growth of these two species. Annual basal area indexes (BAI) were measured for eleven cypress and eight water tupelo trees that were cored. Bald cypress growth data (BAI) from 1900 - 2000 was then split into eight 9-year periods, with 4 occurring pre-dam (1900 - 1908, 1909 - 1917, 1918 - 1926, 1927 - 1935) and 4 occurring post-dam (1965 - 1973, 1974 - 1982, 1983 - 1991, 1992 - 2000). Statistical analysis showed significant differences among the 9 groups, with the period just after dam completion (1965 - 1973) showing the highest growth and the period 1909 - 1917 showing the lowest. However, all post-dam means were not significantly different from each other, and all pre-dam means were not significantly different from each other. The period 1927 - 1935 showed the strongest pre-dam growth - lower but not significantly different than the period 1974 - 1982. BAI steadily increased to a high point in the immediate post-dam era and then declined slightly over time (Fig. 1).

In order to understand whether pre- and post-dam changes in growth have actually been caused by changes in hydrology associated with discharge regulation at dam sites, it will be necessary to show how specific changes in hydrologic regime are associated with tree growth. It will also be necessary to gather cores from bald cypress and water tupelo of similar age in the region surrounding the study site but outside of the Roanoke River watershed itself. This would allow an examination of the influence of regional climate on tree growth response and allow a better understanding of just how much study site trees are responding to hydrology in terms of growth. Such cores will be collected next year.

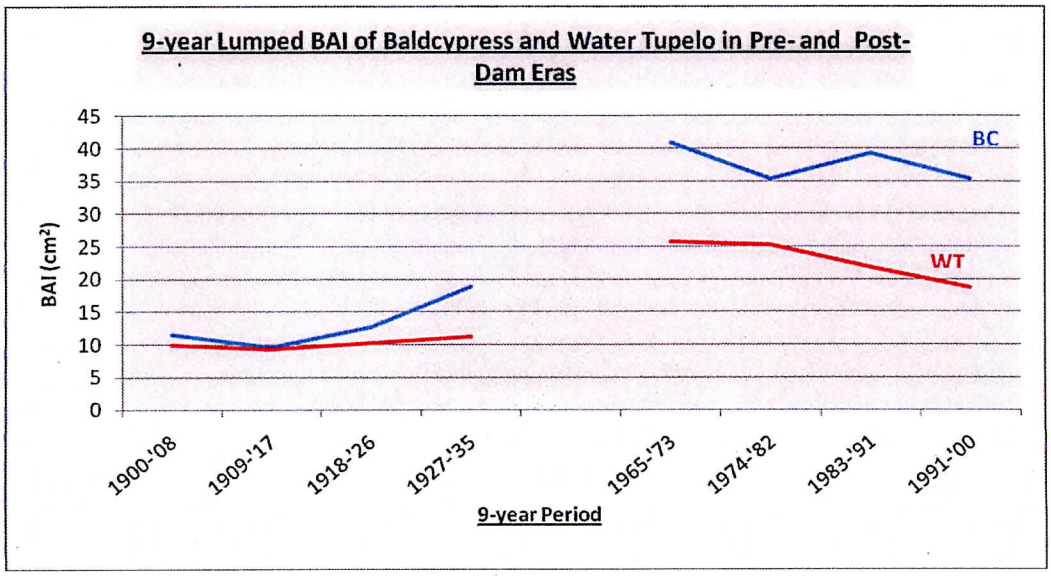


Fig 1. BAI of bald cypress and water tupelo over time in lumped 9-year periods. Bald cypress is in blue and water tupelo is in red.

Digital 06-05-09

The light reaching the forest floor in the background is the result of killing the water tupelo trees present in the canopy; as a result the young cypress in the understory have a new lease on life.

2

Habitat Restoration

2a. Wetland restoration: On-Refuge

In 2004, Refuge staff partnered with Ducks Unlimited (DU), TNC, and NCWRC in putting together a package of wetland restoration, enhancement, and acquisition projects throughout the Roanoke River Basin. The package totaling just under one million dollars was submitted to the North American Wetlands Conservation Council to compete for NAWCA funds. WB Richter proposed two projects for the Refuge. The first is geared towards enhancing approximately 500 acres of cypress/tupelo swamp habitat. The basal area of water tupelo will be reduced in areas where tupelo is the dominant species in an effort to open up the canopy. Target trees will be injected with the herbicide Habitat and left to die. The dead trees will provide nesting and foraging areas for cavity nesting birds and food for insectivores. By opening the canopy the expected outcomes of this project will be to increase the density of cypress in these stands and to increase emergent plant growth that will benefit wintering waterfowl when these areas flood. The Refuge received $50,000 for the tupelo injection portion of the project. WB Richter is working with Dr. William Conner, Clemson University, SC, to carry out the project. Dr. Conner has recruited a Master's student, William deGravelles, to work on this project. The results from the first field season are outlined in ***Section 1b. Studies and Investigations*** under "Roanoke River NWR "The Effects of Artificial Canopy Gap Creation on the Growth and Development of Bald Cypress Advanced Regeneration on the Lower Roanoke River Floodplain, NE NC" (08- 42360-01)."

The second project submitted was to restore the hydrology on approximately 1,100 acres on the Refuge's Rainbow Tract. Three man-made canals are proposed to be plugged. Two are located on the River proper (BN1 and BN2) just upstream of Black Gut. The third canal is located in from the River off from Black Gut that extends into the swamp along an old logging road that runs east-west. After a series of meetings with agency stakeholders, in February 2005 and again in 2006, it was decided by Refuge staff that permanent plugs with no water control structures would be inserted in the canals in an effort to restore the hydrology in this part of the floodplain. DU engineered the project, developed the scope of work, handled the bids, awarded the contract and oversaw construction on the ground. After completion of a USACOE Individual Permit, Division of Coastal Management's Federal Consistency Determination, 401 Certification from NC Division of Water Quality, and responding to concerns raised by the NC Division of Marine Fisheries, the Refuge gave DU the go-ahead to begin work. No major snags were

encountered during construction. Materials were trucked in using low impact equipment via the floodplain to the two canals (BN1 and BN2) versus barging equipment and materials to the project sites. WB Richter met with equipment operators before construction began to map out a 10' wide route through the floodplain to avoid impacts to sensitive habitat. Phelps and White, Inc. was awarded the contract to complete the construction. Work began in September 2008 and was completed in October the same year.

A weeklong 20,000 cfs discharge from Roanoke Rapids Dam in January of this year was the first test to see how the plugs would hold up to high water. WB Richter surveyed the area by foot, vehicle, and canoe and was surprised by the results. Most notable was the significantly lower water levels in the sloughs that Town Swamp Main Road traverses Also in the large interior swamplands that the plugs are directly associated with, water levels were 3-5 feet lower than if the plugs were not in place providing excellent habitat for waterfowl and wading birds. In late June another flood event occurred that lasted 14 days, one week longer than the first. Acting RM Pete Campbell and WB Richter checked the plugs from the river and found that there were major problems. The River had worked its way around the wing-walls of the two plugs setting the footprint for a new canal. A significant design flaw, the wing walls were not high enough or long enough to keep the River out during prolonged high flow events. In addition, water was overtopping the third plug off from Black Gut allowing water to flow over the plug on to the floodplain defeating the whole purpose of the plug. Acting RM Campbell and WB Richter contacted Craig LeSchack, Ducks Unlimited, and informed him of the problem. DU was willing to take responsibility for the engineering flaw. WB Richter and Acting RM Kendall Smith met on site with Billy Webster, DU Engineer, to assess the problem and find a solution. During the site visit Mr. Webster admitted his mistake and said he should have placed the plug one foot higher which would have put the plug at the same elevation as the river levee. To correct the problem it was decided the wing-walls need to be raised and extended approximately 15 feet to tie them into the levee. In addition, the height of the plug will be raised two feet and an earthen berm is to be constructed at the site of the third plug in order to prevent water from overtopping the levee along Black Gut. The scope of work to repair the design flaw was put out for bid by DU. Three bids were received in August and lowest was accepted. DU agreed to cover the cost of extending and raising the wing-walls and the FWS agreed to cover the cost of raising the plug and agreed to build the earthen berm with Refuge resources. The lowest bid came in at $83,000 to correct the problems with the two plugs along the River. DU agreed to cover $54,000 and the Refuge agreed to provide $29,000 via a Challenge-Cost Share Agreement. The contract was awarded in September, dry conditions were present for approximately six weeks and the work never commenced. Heavy rainfall began in mid-November and persisted for the rest of the year causing discharges from the Roanoke Rapids Dam to be at a steady 20,000 cfs. The big concern is the additional damage to the plugs after the prolonged flood event. Picture below show examples of the problems observed in June.

Digital 10-29-09 JR

In June it became evident the plugs could not stand up to a prolonged 20,000 cfs flood. The river came around the wing walls and into the canal.

Digital 10-29-09JR

Extensive cutting around the wing walls of the second plug on the River after 14 days of 20,000 cfs.

Digital 06-23-09 JR

The plug on T-Row ditch off from Black Gut was not constructed to the height of the levee. As a result, water from the Gut overtopped the plug and areas around it.

Digital 01-23-09 JR

With the plugs in place, as indicated by the old high watermarks, water levels appear to be significantly lower. The resulting lower water levels will enable waterfowl access to more food resources.

Digital 01-23-09 JR

After 5 days of 20,000 cfs discharges these hardwoods would have been flooded if the plugs were not in place.

2b. Upland Restoration – On-Refuge

Before FWS purchased the Town Swamp Tract, International Paper cut a large percentage of the hardwoods located in upland areas that are no longer flooded. Left behind were four one-half to one acre areas that were used as loading and staging areas during harvest operations. These areas have remained open with none-to-minimal tree regeneration occurring. In February of 2008, Refuge staff, along with Anthony Davis and Kenny Powell, Pocosin Lakes NWR, and Volunteer Curt Kedley, planted 515 hardwood trees in these areas. Tree species planted were swamp chestnut oak, willow oak, cherry bark oak, black walnut, and persimmon. Plot 1 is located across from Rascoe's Ridge, measures 43 x 45 m, and twenty-five of each of the five species were planted. Plot 2 is located alongside Town Swamp main road, measures 36 x 34 m, and 23 cherry bark oak, and twenty each of persimmon, swamp chestnut oak, black walnut, and willow oak were planted. Plot 3 is located alongside Hickory Ridge Road, measures 48 x 45 m, and 35 cherry bark oak, 26 swamp chestnut oak, and 25 each of persimmon, willow oak, and black walnut were planted. Plot 4 is located off from Break-of-Dam Road, measures 16 x 97 m, and 30 each of the five species were planted. WB Richter checked on the survival status of the trees during the growing season. The persimmon were doing excellent, all the oaks seemed to be doing well, but for some reason the black walnut seem to have a very low survivorship. WB Richter will assess the survivorship of the trees in each of the four plots next year and, if necessary, use herbicide to remove competing vegetation.

2c. Wetland restoration: Off-Refuge

Nothing to report.

2d. Upland restoration: Off-Refuge

Nothing to report.

3

Habitat Management

3a. Manage water levels

Managing water levels means something different at the Roanoke River National Wildlife Refuge. Water is the driving force in a bottomland hardwood forest ecosystem. Over the years water has carved the floodplain and dictated where and what plant and wildlife species are found in the bottomland system. The dams located upstream of Refuge lands manage the water levels downstream in ways that do not mimic what would happen naturally. It is impossible to manage water levels on Refuge lands when water enters from different points along the River. This year the annual hydrograph showing discharges from Roanoke Rapids dam indicated a wet January followed by an unusually dry spring with heavy rainfall in late May and early June causing the floodplain to be inundated for two weeks in late June into July. Rainfall events in August kept the swamps full with a dry down occurring in September and October. Heavy rains started in early November and continued through the end of the year keeping river levels high. See hydrograph at the beginning of the this narrative.

3b. Manage Moist Soil Units

Green Tree Reservoir Project-Askew Tract – For background information on this project refer to the 2007 Annual Narrative. The purpose of this project was to impound water in forested areas during the dormant season to provide habitat for migrating and wintering waterfowl. During periods of extreme drought water can be pumped into the northwest side of the project via a well to provide waterfowl access to habitat they would otherwise not have access to. After 2 ½ years with the project in place the Refuge staff is finding that the project is proving to be difficult to manage and is not meeting all of its intended objectives. One of the challenges is that the project is tied directly to the hydrology of the River. Any flows equal, or greater than, 12,000 cfs will cause water to enter the southeast impoundment via low points along Conine Creek; this is of greatest concern when flows of 12,000 cfs or greater occur during the growing season. The only culvert to drain this impoundment is undersized, is not able to drain water in a timely manner, and can only remain open during work hours otherwise beaver will dam it. A result of having only one small culvert is that several acres of hardwoods may remain flooded in the impoundment during the growing season. Other concerns include the seepage of water into the north impoundment (area north side of the logging road) at flows greater than 12,000 cfs causing this area that was intended to stay dry during the growing season, to

become partially inundated. On 22 February 2008, Refuge staff toured the project area with PL Mike Bryant and Deputy PL Scott Lanier, Alligator River NWR, to discuss problems with project design. On 29 April 2008, Refuge staff met on-site with former FWS Migratory Bird Biologist Bob Noffsinger (one of the original planners of the project), current Migratory Bird Biologist John Stanton, and Private Lands Biologist Kendall Smith to discuss the project design and possible solutions to the problems. A couple of solutions were proposed for the problem with the southeast impoundment: 1) to place another culvert under the road; or 2) to place a rock ford in a once historic low point in the road. Using American Recovery and Reinvestment Act funds it was decided to place a rock ford in a once historic low point on the Askew East banding road. Permits will be developed and submitted to the USACE and NC CAMA next year.

Digital 01-23-09 JR

The Askew Tract Green Tree Reservoir Project was implemented to keep floods of 20,000 cfs out of the North impoundment during the growing season. It is not working as planned; moderate flooding occurred after 5 days of 20,000 cfs releases.

Digital 01-23-09 JR
Moderate flooding of Askew Tract Green Tree Reservoir after 5 days of 25,000 cfs releases.

3c. Graze/mow/hay

Roads on Conine, Askew, and Town Swamp were mowed in September. Town Swamp was mowed in September and October.

3d. Farming

Nothing to report.

3e. Forest Cutting

Nothing to report.

3f. Prescribed burning

Nothing to report.

3g. Control Pest Plants

The patch of kudzu located between BN#1 and BN#2 on the Refuge's Rainbow Tract, observed by WB Richter in 2006, was thought to have been eradicated after two treatments in Fall 2006 and four treatments in Summer 2007; however, that was not so. In early September WB Richter observed some kudzu vines growing towards the canopy in the same location as the original outbreak. The vines were treated in September and again in November. Although the kudzu treated was not a new outbreak, the source of kudzu on the Rainbow Bluffs across the River, upstream from this site, will require Refuge staff to be forever vigilant watching for outbreaks on the Refuge.

4

Fish and Wildlife Management

4a. Bird banding

The Refuge had a pre-season banding quota of 125 wood ducks. This year, 73 wood ducks had been banded missing the pre-season banding quota by 52. Heavy rainfall in May and June resulted in high discharges from the Roanoke Rapids Dam, flooding the banding site. As a result, bait wasn't put out until end of July. Due to the high water, only four banding attempts were able to be made this year with the first one occurring on 20 August and a final effort was made on 16 September. A total of 73 ducks were banded; 2 AHY and 23 HY males and 6 AHY and 42 HY females.

4b. Disease monitoring and treatment

Nothing to report.

4c. Re-introductions

Nothing to report.

4d. Provide nest structures

No new nest structures were erected this year. A wood duck box that had broken off its post was replaced on the lower River. There were plans to put ten boxes in the swamp on Askew East but high water prevented the work from being carried out. A special effort will be made next year. Prothonotary warblers frequently use the wood duck boxes to build their nests. In an effort to reduce the occurrence of prothonotary warblers building their nests in wood duck boxes, 12 nest structures were given to the Refuge by Dr. Eugene Hester. The structures consist of a Metamucil container with its top painted black and an entrance hole drilled in the front. Holes were drilled in the bottom for drainage and on the back to weave an anchor wire though. WB Richter, along with volunteer Jim Brown, a fixed all twelve structures on the back of the poles of those wood duck boxes that had repeat occurrences of warbler use over the years.

4e. Predator and exotic control

Fire ants are still a growing problem along the Askew East and West road, portions of the Broadneck Road running through the Town Swamp Unit, and along the Company Swamp right-of-way. WB Richter treated several active mounds on along the Town Swamp Main Road and Company Swamp right-of-way again this year with Amdro Fire Ant Killer in granulated form. Refuge staff will have to continue to be vigilant about treating these mounds in an effort to control the spread of the ants.

5

Coordination Activities

5a(1). Interagency coordination

USACOE 216 study – For background on the USACOE Section 216 Study and for a review of the progress that has been made on the study in previous years refer to the Annual Narratives from 2001-2007.

The following progress has been made this year on the study that is now due to be completed in 2012:

- Dr. Cliff Hupp, USGS, collected data for the Roanoke River bank erosion study that was contracted by USACOE; a final report was submitted to the USACOE. For a summary of findings, see "Roanoke River NWR "The Effect of a Managed Flow Regime on the Bank Morphology of the Roanoke River NWR" (02-42630-03)" under ***Section 1b. Studies and Investigations*** of this document.
- USACOE has agreed to fund part of the study being carried out by VA Tech Professor, Dr. Diplas, that is looking at the effects of hydropower peaking on bank stability. This study will also look at what types of flow regimes, in addition to peaking, cause the banks to collapse.
- Dr. Jerad Bales, USGS, Raleigh is currently developing water quality modeling tools that can be used to assess the effects of changes in John H. Kerr operations on DO levels in the river and floodplain from the base of the Roanoke Rapids Dam downstream to the mouth of the river. The USGS study will utilize a 3-dimensional hydrodynamic model that will be linked to a 3-dimensional in-stream water quality model (WASP). Once these modeling tools are created they will be used to simulate eight different water quality management scenarios that have been proposed by the Water Quality workgroup. The results of the effort, which are expected to be available in the fall of 2010, may lead to additional measures regarding changes in operations at the reservoir, as well as providing information that could be used to evaluate the effects of measures on habitat in the downstream floodplain.

Last year TNC, along with the Roanoke River Basin Association, proposed to the USACE Wilmington District an interim adjustment to the guide curve at their John H. Kerr project. The proposal in coordination between TNC, DG, and the Southeastern Power Administration the USACOE is proposing to change the guide curve in a way that

would trigger releases in the spring of up to 35,000 cfs in order to remove water from the system sooner. The purpose of this is to modify the water release schedule from Kerr/Gaston/Roanoke Rapids reservoir system to minimize impacts to downstream bottomland hardwood forests. Two sets of public hearings were held in May and August of 2008, at two different locations (Williamston and Halifax), to inform landowners on the lower River who would be impacted by such change. The concern is that anything at 20,000 cfs or greater would impact agriculture fields causing significant crop loss if a growing season flood event occurs. Some of the farmers were against changing anything while others could see the need for change. Flood maps of areas flooded at 20,000 cfs and 35,000 cfs were generated and laid over aerial photos. During the public hearings, landowners were asked to look at their parcel of land to verify whether the information on the maps was correct. The option receiving most attention is Option 6B. This alternative is the best for minimizing impacts to most resources due to winter releases, but agriculture issues remain. The option would result in less frequent flooding around 20,000 cfs, but more frequent flooding around 35,000 cfs which would result in more agricultural land being flooded; however, the more frequent flood events would occur when fields haven't yet been planted during the months of March and April. Due to modeling uncertainty, a winter release test occurred for five days in January to determine the threshold of agricultural flooding. Table 1 below lays out the number of days in a month a given discharge would occur under existing operations and the proposed Option 6B. In December the USACE decided that they would not consider Option 6B as an interim adjustment to the guide curve. Instead, they decided to wrap it into the Section 216 Study and consider it as one or part of an alternative to be evaluated.

Table 1. Comparison of the number of days the mean daily discharge from Roanoke Rapids at a given range of flows would occur with existing operations versus Option 6B. Red numbers correspond to the months that would be effected by the proposed changes in the guide curve.

Existing	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
20,000 to 24,999cfs	62	80	93	75	47	24	18	11	20	31	29	37
25,000 to 29,999 cfs	1	6	9	10	3	3	1	1	2	1	0	0
30,000 to 34,999 cfs	0	0	0	0	0	0	0	0	0	0	0	0
35,000cfs and above	1	2	1	8	6	0	0	1	3	1	0	0
Total # Days	**64**	**88**	**103**	**93**	**56**	**27**	**19**	**13**	**25**	**33**	**29**	**37**
Option 6B												
20,000 to 24,999cfs	56	62	39	17	8	5	14	14	20	32	28	41
25,000 to 29,999 cfs	0	0	1	13	6	1	0	1	2	1	0	0
30,000 to 34,999cfs	0	0	4	9	2	2	1	0	0	0	0	0
35,000cfs and above	12	13	14	20	11	3	0	1	3	1	0	0
Total # Days	**68**	**75**	**58**	**59**	**27**	**11**	**15**	**16**	**25**	**34**	**28**	**41**

The USACOE, Wilmington Office, holds informative conference calls every Tuesday to involve stakeholders in any water management related issues in those river basins where the USACOE has flood control or water supply projects. When time permits, and flow issues are apparent, WB Richter will call in to voice concerns regarding Refuge resources.

Dominion Generation Relicensing Studies - See previous Annual Narratives for a history of relicensing efforts and progress. A 40-year license was issued to DG in early 2005. DG continued to follow its responsibilities under their new license agreement. For example, there is now 325 cfs of water flowing through the bypass reach. WB Richter is a member of the Cooperative Management Teams (CMTs) that will discuss the FL4-downstream ecological impacts of within-week peaking, FL3-downstream ecological impacts of within-day peaking, and FL7-downstream water quality.

The FL4-downstream ecological impacts of within-week peaking team, FL3-downstream ecological impacts of within-day peaking CMTs met twice this year to discuss progress being made on the studies being carried out under the respective articles.

The following progress has been made in getting required studies underway:

- Effects of Hydropower Peaking on Bank Stability: Dr. Panos Diplas, VA Tech University, was awarded a contract to determine the impacts DG's hydropower peaking has on bank stability. This study has been further enhanced through financial support by the USACOE to look at the impacts flood control operations have on bank stability. Data on soil characteristics such as pore water pressure distribution in the soil, slope stability, bank shear stress distribution, erosion, soil adhesion coefficients, etc., have been analyzed and input into a model. Some of the variables in the model being looked at are: magnitude of the base flow, magnitude of the maximum flow, time to ramp up to peaking, time to ramp down from peaking, duration of max flow, and duration of base flow between peaking events. The next step is to determine which flow scenarios should be investigated. Each flow scenario will be analyzed with a step-by-step approach leading to a fully coupled model to determine the impacts of a flow release on erosion and riverbank stability. The coupled model will include individual models for flow, seepage, erosion, and slope stability. The flood events and various peaking events this year proved to be beneficial in collecting needed data for the study. Graduate students John Petrie and Soonkie Nam spent time in the field and lab analyzing data. The executive summary of the preliminary final report can be found below. Field work next year will include carrying out additional lab tests based on soil samples, obtained at the study sites, to characterize the soil's permeability. Additional ground water table will be installed in the field and additional jet tests run.

Executive Summary

This report presents the methods and results of the riverbank erosion and stability study on the lower River. The study combines extensive field work, laboratory testing, and numerical modeling to predict fluvial erosion and mass failures of the riverbank for different field conditions. Flow releases from the Roanoke Rapids Dam provide the majority of water flowing in the lower River. These releases are dependent on the operational mode of the dam which is determined, in part, by weather conditions, environmental considerations, and season. As a result of the different operational modes, the downstream river channel width adjusts through a variety of processes including fluvial erosion and mass failure. Fluvial erosion is the removal of soil from the riverbank by flowing water, while mass failure results in large portions of the riverbank slumping into the river due to slope instabilities. The goal of this study is to determine how specific discharges from the Roanoke Rapids Dam affect erosion and bank stability of the downstream channel. A combination of field work, laboratory tests, numerical models, and analytical techniques are employed to study erosion and mass failure. The field work was carried out to characterize geotechnical properties and hydraulic behavior of the lower River. A study reach was selected that exhibited active erosion and mass failures; within this reach, five sites were selected as representative of the entire reach. Extensive testing was performed in the vicinity of each study site. The geotechnical work included tests to determine soil properties such as shear strength and permeability, measuring in situ soil erodibility, monitoring soil moisture conditions, and collecting soil samples for laboratory tests. The laboratory tests allowed soil properties to be determined under controlled conditions and were performed in specialized facilities at Virginia Tech and Colorado School of Mines. Field measurements of river flow velocity were obtained using an acoustic Doppler current profiler (ADCP). These measurements also provide estimates of river discharge and channel topography. Light detection and ranging (LiDAR) was employed to accurately determine the riverbank geometry above the water surface, which is essential for slope stability analyses. Close to fifty days in the field were required for data acquisition.

The data collected from field and laboratory tests were then used to develop a series of numerical models for relevant processes. The geotechnical modeling includes riverbank seepage with MIDAS/GTS, limit equilibrium slope stability modeling with SLIDE, and finite element slope stability modeling with MIDAS/GTS and Phase2. The hydraulic modeling was performed with HEC-RAS and FLUENT. HEC-RAS is a one-dimensional hydraulic model that provides cross-sectional averaged output such as water surface elevation, velocity, and shear stress. FLUENT is a three-dimensional computational fluid dynamics program that is used to determine detailed information about specific study sites. While all the modeling software used here is well established in industry, some applications and the combination of models is unique to this study. For example, FLUENT has been used to model laboratory open channel flows, but models of actual rivers are relatively rare. Using a coupled modeling procedure, the effects

of different flow scenarios on erosion and bank stability were assessed. The flows can be classified as either steady or peaking scenarios. Steady flows occur when the discharge in the river does not vary significantly with time and peaking operations generate large changes in discharge leaving the dam over short periods of time. Steady flows of 20,000 cfs, typical of flood control operations, were found to generate fluvial erosion at the study sites investigated. Erosion was predicted to be largest near the toe of the bank, due to increased shear stress calculated at that location. Mass failure was not predicted under a steady flow of 20,000 cfs for durations up to eight weeks. However due to cumulative erosion for several flow events, the stability of the bank will continue to decrease which may eventually result in failure. Additionally, rapid drawdown conditions after sustained high flows could be critical for soils with low permeability. Steady flows of 11,000 cfs and below were not found to result in significant fluvial erosion. Several test cases believed to be critical were performed to assess the effect of water surface fluctuations due to peaking operations on riverbank stability. These test cases showed that short-term peaking operations did not cause an increase in riverbank instability when compared with the steady flow cases. These results combined with the lack of erosion predicted for low discharges suggest that peaking operations have little short-term impact on fluvial erosion and bank stability on the study reach. Thus, the most critical flow scenarios resulting from current operational modes appear to be those related to flood control, which results in high discharges that may be sustained for several months, and subsequent rapid drawdown. Given the complexity of the physical processes and corresponding numerical models employed, the authors feel there is a need to further refine the numerical procedure and potentially obtain further field data to clarify the findings stated in this report. The present results then should be viewed as preliminary findings of an ongoing analysis. The majority of the uncertainties in this report arise from limitations in the ability to quantify certain natural phenomena, particularly those related to cohesive soil erosion. The uncertainty due to field measurements and numerical calculations was addressed at this stage by considering a range of likely values for important parameters. Additionally, the results presented in this report are limited to site conditions on the study reach of the lower River and should not be considered general results applicable to all regulated rivers or even the entire lower River.

- Hardwood Regeneration: Dr. Robert Peet, UNC- Chapel Hill, is the Principle Investigator for this study. Under the guidance of Dr. Peet, Doctoral student Jackie White was recruited to carry out the hardwood regeneration study DG is required to do as part of their settlement agreement. Ms. White completed her third field season this year. Refer to past Annual Narratives for background information on design. The goal of this study is to assess the impact of Roanoke Rapids Dam operation procedures on downstream bottomland hardwood forest regeneration. Data was recorded on 118 seedling plots in which 23 new plots were added to this year's monitoring effort and 95 plots were re-sampled. Due to concerns about deer browse, deer exclosures were placed around 27 of the plots. The plots are located between Weldon and Devil's Gut and span an array of

hydrological gradients on the floodplain that are impacted by DG's flow releases as well as the USACOE's releases. Forty-six plots are located in the zone of inundation when flow releases are between 6,000 – 14,000 cfs for five or more days; this is the zone that DG is thought to have an impact on during their peaking operations. Eight plots are located in the 0—6,000 cfs zone of inundation and 38, 17, and 9 plots are located in the 14,000—20,000 cfs, 20,000—35,000 cfs, and 35,000—100,000 cfs zones of inundation, respectively. Intensive seedling counts and measurements were taken on two smaller 5 m x 1 m plots nested within the bigger plot. DG's study differs from the seedling plots monitored by WB Richter whose plots are located in the hardwood zone impacted by flows greater than 18,500 cfs. The top five species encountered in the DG study listed in order of abundance were: ash, red maple, elm, box elder, and ironwood. Ms. White's study is partially funded by FWS using challenge-cost share grant funds matched by DG; $10,000 of FWS funds have been contributed each year to the study for the past three years. Next year will be Ms. White's last field seasons to assess the impacts of DG's operations on downstream bottomland hardwood forest regeneration. In-situ Level Trolls have been placed in select locations near the seedling plots in order to monitor the extent and duration of flooding of the seedling plots.

Activities this year included:

- Removing excluding devices for deer. They did not hold up to the environmental conditions and it was concluded that there is some deer browse occurring although it is not significant enough to warrant maintenance of the exclosures.
- Monitored twice, the 118 sites established in 2007-08. Once before the flood in June and then after to determine survivorship.
- Collected additional plot data; e.g., canopy cover and soil nutrient characteristics,
- Ground truthed inundation during flood control period in June.
- Re-sampled 30 historical plots established in the early 1990's by the NC Vegetation Survey.
- Focused on developing a correlation between river stage, floodplain well elevation, and seedling recruitment/survival
- Some of the results from the 2007-2009 field seasons are presented in Table 2 and Figure 2.

Table 2 . Total number of older seedlings by sampling event

Year	Initial	Recount	Survival
2007	**10466**	**8369**	***0.799637***
2008	**13685***	**12917**	***0.94388***
2009	**14393**	**10432**	***0.724797***

*reflects a 20% increase in sample size.

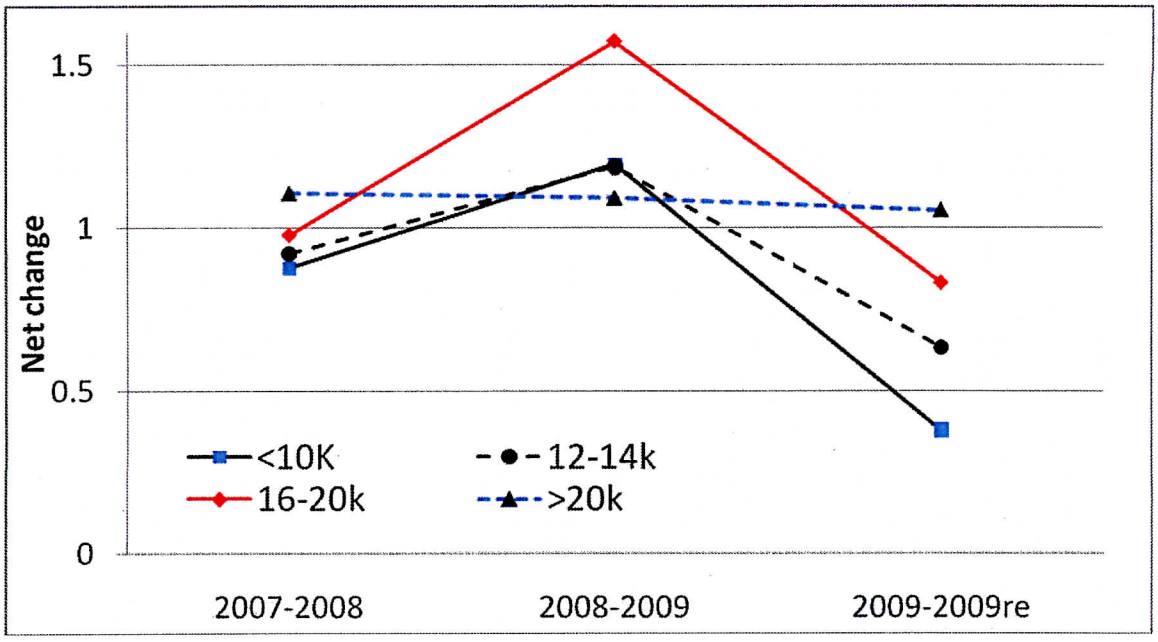


Figure 2. Net change in seedling abundance by inundation class between years

In 2010 work will concentrate on:

- Monitoring recruitment and survival in the 118 established plots.
- Well monitoring
- Model seedling survival
- Habitat suitability analysis
- Summarize patterns of germination, establishment and survival
- Assess relationships with site characteristics
    - Hemispheric photo interpretation
    - Soil analyses
    - Vegetation classification
- Habitat suitability modeling
    - Quantify probability of a species survival within a habitat

Digital unknown date and/or photographer
Jackie White, PhD Candidate, UNC-Chapel Hill, revisiting one of the many permanent plots across the floodplain to tally recruitment and survivorship of hardwoods.

- Effects of Hydropower Peaking on Benthic Macroinvertebrates: Dr. Leonard Smock, Virginia Commonwealth University, was awarded the contract to study the effects of hydropower peaking on macroinvertebrates both in-stream and in-tributaries. Background information concerning this study can be obtained from the 2007 and 2008 Annual Narratives. This year was the third year of the study. The three questions being examined for the macroinvertebrate study are stated below and findings to date summarized after each.

  Q1) Does hydropower peaking affect the general health of the benthic community in the Roanoke River upstream of Weldon?

  Macroinvertebrate drift sampling provided conclusive evidence of peaking effects for both 2008 and 2009. Most notably, hydropeaking was associated with a large (several orders of magnitude) increase in the abundance of drifting macroinvertebrates in the system.

  Q2) Is there a longitudinal effect of hydropower peaking on the benthic community downstream from the source of peaking?

  No clear evidence of hydropeaking was obtained from the longitudinal sampling. Inherent natural variations in hydrology and geomorphology among the longitudinal study sites were identified as confounding factors for using benthic community comparisons among them to assess peaking effects. Therefore, the

longitudinal investigation was discontinued after 2008. For 2009, time and resources were reallocated to the artificial substrate investigation discussed above.

Q3) Does hydropower peaking affect the general health of the benthic community in tributaries to the Roanoke River that are inundated during peaking?

For each of the three study years, macroinvertebrates were sampled in wadeable tributary streams to the River according to the NCDENR protocol for wadeable swamp streams (NCDENR 2006). Two second- to third-order tributary streams to the Roanoke River, Quankey Creek and Looking Glass Run, were chosen based on hydrologic data from periods of normal flow and during peaking events that indicated that the lower reaches of these streams were affected by hydropeaking. Samples collected from the Roanoke River tributary sites were compared to those collected from Tyson Creek, a tributary of the Tar River, which is not affected by hydropeaking. In addition to the macroinvertebrate sampling conducted, in order to more completely assess whether hydropeaking affected the hydrology of the streams, water level monitors were installed at the tributary sites in 2008 and 2009. The water level monitoring data showed no evidence that any of the study sites were affected by hydropeaking in 2008 or 2009. In 2009 the lower (downstream) sampling site along Looking Glass Run exhibited a water level rise that was associated with the sustained high flow on the River mainstem that occurred during flood control operations. Macroinvertebrate sampling indicated that the downstream Looking Glass Run site generally exhibited the lowest overall ecological integrity of the study site. The results of the tributary investigation provide preliminary evidence that the macroinvertebrate communities of Looking Glass Run may be affected by hydrologic modification on the river mainstem.

- Effects of Hydropower Peaking on Fish Communities below the dam at Roanoke Rapids: Dr. Stephen McIninch, Virginia Commonwealth University, was awarded the contract to look at the effects of hydropower peaking on the fish communities below the dam at Roanoke Rapids. Background information concerning this study can be obtained from the 2007 and 2008 Annual Narratives. This year was the third year of the study. The two questions being examined for this fish study are stated below and findings to date are summarized after each:

  Q1) Does hydropower peaking effect fish community composition in the channel and shallow water habitats of the Roanoke River upstream of Weldon, NC?

  The small amount of fish community variation observed during the three-year study period supports the possibility that the present assemblage has adapted to a regulated flow regime. Additional information on adaptations in life history and behavioral traits would aid in the understanding of how riverine fish communities adapt to regulated conditions in the southeastern coastal plain.

Q2) Is there a longitudinal pattern of fish community variation away from the source of peaking?

The fish community of the River between Roanoke Rapids and Hamilton does not exhibit variation that may, at this time, be attributed solely to hydropeaking. Variation in hydrology, river morphometry, and habitat structure along longitudinal gradient may account for variation in community structure and species abundance in riverine ecosystems. Likewise, differences between corresponding sites from the Cape Fear and Neuse Rivers cannot be attributed to hydropeaking at this time.

A summary for both the benethic macroinvertebrate studies and fish studies follows:

The community-level fish and benthic sampling conducted from 2007 to 2009 did not yield conclusive evidence of peaking effects. The system has been regulated for hydroelectric power generation for decades and, therefore, variations in community structure due to peaking have likely stabilized. The time-scale of the pre- versus postpeaking comparisons of fish and macroinvertebrate community samples may be insufficient for assessing community changes related to anthropogenic flow regulation. In addition, the extent to which community members have altered life history and/or behavioral traits to the regulated flow regime cannot be assessed from the community level analysis provided herein. The macroinvertebrate drift investigation conducted at Roanoke Rapids yielded conclusive evidence of short-term hydropeaking effects. The data provided by the drift investigation should be supplemented by an assessment of the fate and transport of drifting macroinvertebrates and the effects of these phenomena on the feeding of invertivorous fishes. Investigations of important population dynamics (e.g., life history adaptation to regulated flow regimes) and ecosystem processes (e.g., fate and transport of drifting macroinvertebrates) would allow us to determine the extent to which observed effects of hydropeaking are detrimental to the ecosystem as a whole.

Other relicensing studies also underway, in which Refuge staff are not necessarily involved, include releasing American eel elvers in Deep Creek, a tributary that drains into the Roanoke Rapids Reservoir. Acting RM Laney and WB Richter assisted Bob Graham from DG survey American eel elvers that had been released a few weeks before in Deep Creek in an effort to determine their location; i.e., whether they went upstream or downstream towards the reservoir. The FWS and NMFS reserved the right to prescribe passage for American eel above the Roanoke Rapids and Gaston Reservoirs in the relicensing settlement. This study is looking at whether the eels will stay in the creeks or leave never to be seen again. Below is a group photo from the American eel sampling expedition to Deep Creek (Roanoke River drainage) taken by Nat Wooding on 18 July.

The photo below documents a good working partnership between FWS Refuges (Jean Richter), National Fish Hatcheries (Aubrey Onley and Sam Pollock, Edenton NFH), Fisheries Coordination (W. Laney, South Atlantic Fisheries Coordination Office), industry (Dominion Generation, Bob Graham and Nat Wooding), and private enterprise (Chad Coley of Commonwealth Environmental). The next trip will further include staff

from FWS Ecological Services (John Ellis), NMFS (Fritz Rohde) and The Nature Conservancy (Chuck Peoples, Roanoke River Project Coordinator).

Digital 07-24-09 Nat Wooding
After releases of American eel elvers two and four weeks prior, two elvers were found during this survey of a portion of Deep Creek. (L-R, Aubrey Onley & Sam Pollock, Edenton NFH (standing);Chad Coley, Commonwealth Environmental Consultants; Bob Graham, Dominion Generation; WB Richter, Refuge; Acting RM Wilson Laney, SAFC Office.)

Dominion Generation Transmission Line Right-of-Ways (ROW) - WB Richter coordinated with Mike Brucato on the management of the Company Swamp DG ROW. Mr. Brucato and WB Richter walked the ROW on 28 October and identified a few danger trees. High water prevented the ROW maintenance crew from getting on-site to cut the trees this year.

5a(2). Intra-agency coordination

WB Richter continued to work with Dr. Hupp, USGS, on the bank erosion study. An intra-agency agreement that was set up last year between the Refuge and the USGS, Fish and Wildlife Coop Unit, Clemson University, for work on restoring cypress trees to the swamp forests on the Rainbow Tract continues. Refuge staff continue to support the hydro acrostic work on migratory fish being carried out by students of Dr. Joe Hightower, NCSU USGS Fish and Wildlife Coop Unit. A small equipment shed is located on Askew west to protect the computers and acrostic devices from the elements. The Refuge also continues to provide logistical support for the Swainson's warbler work through a Cooperative Agreement with the Fish and Wildlife Coop Unit at NCSU.

5b. Tribal coordination

Nothing to report.

5c(1). Private land activities (Easements)

The Refuge administers 66 conservation easements (by RO Tract – 100 easements by Refuge Tract), several of which have been subdivided, totaling approximately 116 sub-tracts. There are 86 landowners involved in these easements. These parcels are located in 19 counties in the Roanoke-Tar-Neuse-Cape Fear Ecosystem. The easements total approximately 3,045 acres. The average easement size is approximately 30 acres with the largest easement totaling 346.2 acres and the smallest tract totaling 1.21 acres. The following is a breakdown of the holdings by county.

County	**Regional Office Tract Numbers**	**Refuge Tract Numbers**	**Number of Landowners**	**Acres**
Alamance County	2	2	6 (John Jordan = 2 tracts)	11.4
Bertie	1	2	1	50.32
Bladen	1	1	1 (NCWRC)	37.96
Caswell	3	3	3	101.23
Cumberland	3	3	3	140.98
Edgecombe	2	2	2	60.67
Franklin	3	3	3	119.8
Gates	1	1	1	82.2
Halifax	3	6	3	83.80

Harnett	1	2	2	42.14
Hertford	1	1	1	125.79
Martin	1	1	1	26.93
Nash	7	18	8+1 (USFWS Fee Title)	305.69
Northampton	9	11	10	241.86
Orange	5	5	14	47.67
Rockingham	1	1	1	74.73
Sampson	19	35	23 + 1 (USFWS Fee Title) (NCWRC = 7 tracts)	1454.03
Wake	2	2	2	25.44
Wilson	1	1	1	11.93
TOTAL	66	100	86	3044.57

All easements are classified as palustrine forested wetlands (Cowardin et. al. 1979 Classification of Wetlands and Deepwater Habitats). Using the general wetland habitat types defined by the "Department of Environment, Health and Natural Resources 1996, A Field Guide to North Carolina Wetlands," the holdings include bottomland hardwoods, pocosin, swamp forest, headwater forest, and beaver swamp complex. These latter classifications should be viewed as tentative.

There still has been no progress on the Orange County 13C easement encroachment/motorcross activity damage (this is the easement that was subdivided, sold with lots, and currently has approximately eight different landowners). ZO Canada, SA Baker, PLB Smith, and RM Chappell visited easement 13C in Orange County on 11 September 2007 to assess the damage from the motorcross activity and look at rehabilitation. Rehabilitation recommendation was for grasses to be planted during a Jan/Feb timeframe. ZO Canada does not have timeframe for litigation as this point.

BT Railey conducted 10 easement inspections in 2009, met with several landowners, as well as the Tar River Land Conservancy and NC DENR regarding partnerships in managing easement issues. The distances to most of these easements and the other demands of RRNWR staff continues to be a problem in monitoring/protection of these wetlands.

5c(2). Private land activities (Partners)

Nothing to report.

5d. Oil & gas activities

Nothing to report.

5e. Cooperative/Friends organizations

Partnership for the Sounds (PFtS) – Nothing to report.

Roanoke River Partners – Nothing to report.

Roanax Sponsas Society, Inc. (RSS) – There has been no activity of the friends group since 2006.

Albemarle-Pamlico Conservation and Communities Collaborative (AP3C) – This collaborative was formed in 2007 by TNC, DU, and the Environmental Defense Fund. The mission of the AP3C is three fold: 1) Develop approaches that integrate economic and ecological resilience for the lands, waters, and communities of the Albemarle-Pamlico Region; 2) Recognize the challenges presented by economic and social distress, climate change, population change, and increasing risks to public health; and 3) Implement collaborative, sustainable solutions for well-being. The AP3C provides an open forum to identify and pursue opportunities for collaborative action among participants and to enhance the coordination of their individual projects. In other words, this collaborative provides a great opportunity to network with people working within the region who have a concern for protecting the natural resources of the region but also recognize the need for economic growth and social well-being. It allows for smart, sustainable growth in the region. Due to time constraints, Refuge Staff did not attend the one meeting held this year however FWS employees from other offices did attend. There was only one meeting held this year and no word as to when the next is scheduled. Let's hope this collaborative effort does not waste away.

6

Resource Protection

6a. Law Enforcement

There is no permanent law enforcement presence at the Refuge. ZO Canada continues to provide limited law enforcement during Refuge hunts. ZO Canada charged five subjects for fishing in an area closed to fishing and discovered approximately 10 boundary signs vandalized.

6b. Wildfire preparedness

A final Fire Management Plan was completed this year and is located in the Refuge files.

6c. Manage permits and economic uses

Nothing to Report.

6d. Contaminant investigation and cleanup

There is still no settlement agreement for the old Weyerhaeuser, now Domtar, pulp mill in Plymouth. The EPA, FWS, National Marine Fisheries Service, and NCWRC have been negotiating a settlement from the data collected in a Natural Resources Damage Assessment but with new personnel in place negotiations hit a snag. FWS Contaminants Biologist Tom Augspurger, Raleigh FO, has told us that due to the snag, negotiations have been set back to square one. A final settlement may be a ways off.

6e. Manage water rights

Nothing to report.

6f. Manage cultural resources

Nothing to report.

6g. Federal facility compliance act

Nothing to report.

6h. Land acquisition

Alligator River NWR Deputy RM Scott Lanier held a series of meetings to look at land protection for the refuges located in eastern North Carolina. Other participating conservation partners included The Nature Conservancy, The Conservation Fund, Department of Defense, and the NC Wildlife Resources Commission. Land acquisition priorities were outlined on maps as well as acquisition strategies amongst the partners on how to plan for sea level rise in a way that will ensure that those fish and wildlife species displaced due to lost habitat will have a place to go. Alligator River NWR, GIS specialist, Brian Van Druten developed a set of maps with the updated land acquisition priorities for all to review. Another meeting has not been held since. In addition, Secretary of Interior Salazar came up with a treasured landscapes initiative in which the Eastern North Carolina Coastal Refuge Complex were invited to submit an acquisition proposal of all outstanding lands they would like to acquire. For the Roanoke River NWR, WB Richter sat down with Mr. Van Druten and identified all land not currently under conservation protection in the 100 year zone. There is a total of 113,300 acres that fall within the 100 year flood zone. Of that, 34,800 acres are already protected by the FWS or other conservation agencies/organizations. The remaining 78,000 acres were proposed to be part of the expansion of the Refuge in the treasured landscape initiative.

6i. Wilderness and natural areas

Nothing to report.

6j. Threats and conflicts

Nothing to report.

7

Alaska Only

8

Public Education and Recreation

8a. Provide visitor services

Hunting – All hunt opportunities for the Refuge are administered by the North Carolina Wildlife Resources Commission (NCWRC) as part of the state's special hunt opportunities. Permits are drawn and issued by the NCWRC. Many hunting opportunities were available on the Refuge for 2009.

Four 3-day turkey hunts were offered, as well as the annual youth turkey hunt. Turkey hunts began 15 April and ended 8 May.

Conine Island offered hunters early and late season waterfowl hunts in accordance with North Carolina State seasons. Small game hunts were offered seven times between October and December. The entire month of December is open to small game hunting (Monday - Saturday).

Deer hunting was available on five Refuge tracts - Broadneck, Company Swamp, Conine-Askew, Great and Goodman Islands-Hampton Swamp, and Town Swamp. The archery season was open 12 September – 9 October. Muzzleloader season was open from 10 – 16 October. Five three-day regular gun hunts were offered beginning 22 October ending 21 November. There is no accurate way to collect data on hunter show rates at the Refuge.

8b. Outreach

Information Booths, Talks etc. -

WB Richter

- Gave a talk to The Carolina Bird Club and conducted boat bird tour on the Cashie River for them 30 & 31 January
- River Park North Bird Club in Greenville 8 September

OA Jager

- Presented program on frog metamorphosis to 3rd Grade at Bearfield Primary, Ahoskie on 12 January
- Presented program on frog metamorphosis to Academically and Intellectually Gifted Program at Bearfield Primary, Ahoskie on 23 January
- Presented program on frog metamorphosis for children's program at Ahoskie Library on 13 May
- Presented program on "My Big Backyard" to children's summer program at Ahoskie Library/Bearfield Primary on 7 July
- Presented Nature Program for Tri-County Cub Scouts Twilight Camp each evening 13-16 July
- Manned booth at the Roanoke-Chowan Wildlife Club's National Hunting and Fishing Day in Winton on 26 September

Interpretive Materials –

No new interpretive materials were acquired this year.

9

Planning and Administration

9a. Comprehensive management planning

Work on the stepdown plans began that were outlined in the final Refuge CCP. WB Richter is aiming to complete a final road/utility maintenance right-of-way plan, a final nuisance species plan, and a draft habitat management plan.

9b. General administration

This was the fourth field season for the Swainson's warbler productivity study on the Refuge. Refuge staff assisted researchers with logistics of gathering and signing out equipment needed for the study. See "Roanoke River NWR "Investigating Influences on Swainson's Warbler Nest Survival in a Bottomland Hardwood System Subjected to Asynchronous, Aseasonal Flooding" (04-42360-01)" under ***Section 1b. Studies and Investigations*** for details. The Refuge transferred money to DG for the hardwood regeneration study being carried out by Jackie White. See "Dominion Generation Relicensing Studies, Hardwood Regeneration Study" under ***Section 5a(1). Interagency Coordination*** for details.

OA Jager continues to provide administrative support to Mackay Island NWR via telephone and computer contact. She worked at Pocosin Lakes 2 days a week, on average, helping their OA catch up on administrative work.

EEO Wilkins continues in his capacity as MOCC instructor at Savannah and Santee NWR's.

The following is a list of employees who were members of the 2009 Roanoke River National Wildlife Refuge staff:

Permanent Full Time	Grade	EOD
Michelle Chappell Refuge Manager (Transferred to Southwest Region 24 May)	GS-09	04/21/03
Matthew V. Connolly Refuge Manager	GS-13	11/08/09
Jean M. Richter Wildlife Biologist	GS-12	05/12/96
Diana R. Tilghman Information Technology Specialist	GS-11	11/08/09
Doak Wilkins Engineering Equipment Operator	WG-10	01/04/98
Rosetta R. Railey Wildlife Biological Science Technician	GS-06	05/10/09
Sherrie E. Jager Office Assistant	GS-06	08/20/95

Volunteers and Interns

Mr. Jim Brown
Volunteer

Training

Matt Connolly

- 2009 Federal Information Systems Security Awareness, Online, DOILearn, 27 Mar
- 2009 Discrimination and Whistleblowing in the Workplace, (No Fear) DOILearn, 27 Mar
- 2009 Orientation to the Privacy Act, DOILearn, 27 Mar
- 2009 Records Management Awareness, DOILearn, 27 Mar

Sherrie Jager

- IDEAS-PD Refresher, Atlanta, Ga, 11-12 Mar
- 2009 Federal Information Systems Security Awareness, Online, DOILearn, 27 Mar
- 2009 Discrimination and Whistleblowing in the Workplace, (No Fear) DOILearn, 27 Mar
- FWS SAMMS Crossover Course, Online, DOILearn, 1 Apr
- NSC Defensive Driving II, Online, DOILearn, 1 Apr
- SAMMS Refresher, Pocosin Lakes NWR, Columbia, NC, 29 Apr
- FFS Refresher, Tampa, FL, 8-11 Jul
- 2009 Orientation to the Privacy Act, Online, DOILearn, 13 Jul
- 2009 Records Management Awareness, Online, DOILearn, 13 Jul
- Reptiles & Herp Identification, NCWRC, Cool Springs Environmental Center, 28 Oct

Rosetta Railey

- 2009 Federal Information Systems Security Awareness, Online, DOILearn, 30 Apr
- Travel Card Holder Training, Online, DOILearn, 28 May
- MOCC, Manteo, NC, 15-19 Jun
- Airboat Safety, Manteo, NC, 15-19 Jun
- ATV Rider Course, Windsor, NC, 25 Jun
- 2009 Records Management Awareness, Online, DOILearn, 7 Jul
- 2009 Orientation to the Privacy Act, Online, DOILearn, 7 Jul
- 2009 Discrimination & Whistleblowing in the Workplace (No Fear), Online, DOILearn, 7 Jul
- GPS Introduction for Natural Resource Field Personnel, NCTC, Aug. 3-6, 2009
- Land Environmental Site Assessment Level 1 Procedures, NCTC, Sept. 1-4, 2009
- Reptiles & Herp Identification, NCWRC, Cool Springs Environmental Center, 28 Oct
- GIS Introduction for Conservation Professionals, NCTC, Nov. 2-5, 2009

Jean Richter

- Defensive Driving - 8 hr, Pocosin Lakes NWR, Columbia, NC 20 Apr
- ATV Rider Course, Windsor, NC, 25 Jun
- Records Management Awareness, Online, DOILearn, 29 Jun
- Federal Information Systems Security Awareness, Online, DOILearn, 2 Jul
- Discrimination & Whistleblowing in the Workplace (No Fear), Online, DOILearn, 8 Jul
- Orientation to the Privacy Act, Online, DOILearn, 13 Jul
- Pesticide Use License Recertification Classes - 8 credit hours - 29 Jul

Diana Tilghman

- 2009 Federal Information Systems Security Awareness, Online, DOILearn, 30 Jan
- 2009 Discrimination & Whistleblowing in the Workplace (No Fear), Online, DOILearn, 3 May
- 2009 Orientation to the Privacy Act, Online, DOILearn, 3 May
- 2009 Records Management Awareness, Online, DOILearn, 3 May
- Information Security and the Internet, Online, DOILearn, 16 Jun
- Customization and Security in Internet Explorer 7, Online, DOILearn, 21 Jun
- Network Security Issues, Online, DOILearn, 23 Jun
- Windows Server 2003 - Managing Users, Groups, and Computers, Online, DOILearn, 23 Jun
- Computer Security Incident Response Training (CSIRT), Online, DOILearn, 24 Jun
- FY2009 DOI Role Based Security Self Certification Test, Online, DOILearn,
- 26 Jun
- Quicktime Timekeeper, Online, 15 Jan

Doak Wilkins

- Firearm Safety & Familiarization Course, Pocosin Lakes NWR, Columbia, NC, 26 Feb
- Environmental Compliance Training, Online, DOILearn, 18 Mar
- Defensive Driving Course, Pocosin Lakes NWR, Columbia, NC, 20 Apr
- SAMMS Refresher, Pocosin Lakes NWR, Columbia, NC, 29 Apr
- MOCC Airboat Safety, Manteo, NC 15-19 Jun
- ATV Rider Course, Windsor, NC, 25 Jun
- 2009 Federal Information Systems Security Awareness, Online, DOILearn, 8 Jul
- 2009 Discrimination & Whistleblowing in the Workplace (No Fear),, Online, DOILearn, 8 Jul
- 2009 Orientation to the Privacy Act, Online, DOILearn, 8 Jul
- 2009 Records Management Awareness, Online, DOILearn, 8 Jul

FEEDBACK

With the transfer of RM Chappell to FWS Southwest Region in April the Refuge received help from a long list of wonderful people willing to step up and give their time. The following were Acting Managers for the Refuge during this transition:

1-26 June	Pete Campbell (Raleigh ES)
29 Jun-10 Jul	Kendall Smith (Columbia Mig Bird FO)
13-31 Jul	Wilson Laney (South Atlantic FRO, Raleigh)
3-14 Aug	Art Beyer (ARNWR, Red Wolf Program)
17-28 Aug	Greg Walmsley (Pee Dee NWR)
31 Aug-11 Sept	Cindy Lane (Great Dismal Swamp NWR)
14-18 Sept	Bryan Poovey (Great Dismal Swamp NWR)
21-25 Sept	Cindy Lane (Great Dismal Swamp NWR)

We are grateful to each and every one of them, they made our jobs much easier during the time it took for a new manager to come on board. Matthew Connolly officially began his tenure as Manager on November 8. He did not physically arrive until the 12th and his arrival coincided with the landfall of Hurricane/Tropical Storm Ida, a large rain/flood event. This made his first visit to the station memorable, to say the least. RM Connolly was previously the Project Leader at Vieques NWR; he brought with him his wife Julie and his children Conan and Ora.

We were also fortunate to get the addition of Bio-Tech Rose Railey and Field IRTM Diana Tilghman. Diana is physically stationed with the Migratory Bird Program in Columbia and is supervised by RM Connolly.

This has been a year of changes, arrivals, and departures. The Refuge and staff have grown and changed along with this. We will miss those who have gone before, welcome those who have arrived, and eagerly anticipate all the future will bring.